LOCATION ACEITUNAS PR

Established Series
Rev. RER
06/2002

ACEITUNAS SERIES

The Aceitunas series consists of deep, well drained, moderately permeable soils. They formed in fine textured alluvial and colluvial sediments. These soils are on footslopes, alluvial fans and valleys in coastal plains. Slopes range from 2 to 12 percent. Mean annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Paleudults

TYPICAL PEDON: Aceitunas clay in a sugarcane field.
(Colors are for moist soil)

Ap--0 to 7 inches; dark reddish brown (5YR 3/4) clay; moderate medium granular structure; firm, slightly sticky, plastic; many fine roots; many fine quartz grains; very strongly acid; abrupt smooth boundary. (5 to 10 inches thick.)

Bt1--7 to 15 inches; yellowish red (5YR 4/6) clay; moderate fine and medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; thin patchy clay films; many fine quartz grains; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bt2--15 to 23 inches; yellowish red (5YR 4/8) clay; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; thin patchy clay films; common fine quartz grains; common root channels; very strongly acid; clear wavy boundary. (6 to 10 inches thick)

Bt3--23 to 36 inches; yellowish red (5YR 4/8) clay; weak fine subangular blocky structure breaking to weak fine granular structure; friable slightly sticky, plastic; few fine roots; common fine quartz grains; common root channels; very strongly acid; clear wavy boundary. (10 to 15 inches thick)

Bt4--36 to 60 inches; red (2.5YR 4/8) clay; weak fine subangular blocky structure with shiny ped surfaces; firm, slightly

sticky, plastic; few fine roots; many fine quartz grains; very strongly acid.

TYPE LOCATION: Noroeste SCD, Puerto Rico; 2.5 miles southeast of the town of Aquadilla. 2.3 kilometers on unnumbered paved road south of kilometer marker 123.5 of highway 2. 25 feet west of highway.

RANGE IN CHARACTERISTICS: The solum is more than 60 inches thick and the argillic horizon is more than 50 inches.

The A horizon has hue of 5YR or 2.5YR and value and chroma of 2 through 4.

The Bt horizon has hue of 5YR or 2.5YR values of 4 to 6 and chromas of 6 to 8. Structure ranges from weak, fine and medium to moderate fine and medium subangular blocky.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: The Aceitunas soils occur on gently to moderately sloping footslopes, alluvial fans and valleys associated with limestone hills with slope gradient from 2 to 12 percent. The regolith consists of fine textured sediments washed from the surrounding limestone hills. The climate is humid tropical. The average annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Tanama, Coto, and Matanzas series and the land type Limestone Outcrop, all of which are nonacid. The Tanama soils are neutral and shallow to hard limestone. The Coto soils are yellower and have oxic horizon that extends to more than 50 inches below the surface. The Matanzas soils are redder, shallower and have oxic horizons. Limestone Outcrop is a land type that consists of outcrops covering 75 percent or more of the surface area.

DRAINAGE AND PERMEABILITY: Well drained, medium runoff, moderate permeability.

USE AND VEGETATION: Most of the acreage is in sugarcane.

DISTRIBUTION AND EXTENT: Northwestern coastal plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Noroeste SCD, Puerto Rico, 1963.

REMARKS: These soils were formerly included in the Coto series.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 7 inches (Ap)

Argillic horizon - 7 to 60 inches (Bt1, Bt2, Bt3, and Bt4)

ADDITIONAL DATA: S72PR-16-1, NSSL

National Cooperative Soil Survey
U.S.A.

LOCATION AGUADILLA PR

Established Series
Rev. RER
04/2000

AGUADILLA SERIES

The Aguadilla series consists of deep, excessively drained, rapidly permeable soils. They formed in sandy sediments derived from volcanic rock and mollusk shells. Slopes range from 0 to 2 percent. Mean annual precipitation is 80 inches and the mean annual temperature is 77 degrees F.

TAXONOMIC CLASS: Mixed, isohyperthermic Typic Udipsamments

TYPICAL PEDON: Aguadilla loamy sand in a pasture.
(Colors are for the moist soil)

Ap--0 to 8 inches; dark brown (10YR 3/3) loamy sand; single grain; loose, nonsticky, nonplastic; many fine roots; very strongly acid; clear smooth boundary (6 to 12 inches thick).

C1--8 to 20 inches; brown to dark brown (10YR 4/3) sand; single grain; loose, nonsticky, nonplastic; few fine roots; very strongly acid; clear smooth boundary (8 to 16 inches thick)

C2--20 to 40 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose, nonsticky, nonplastic; very strongly acid; gradual smooth boundary (15 to 25 inches thick)

C3--40 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose, nonsticky, nonplastic; strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico, 3.0 miles east of the town of Yabucoa, in the Roig farm, 100 feet north from farm road and 300 feet south from east end of sugarcane plantation, in St. Augustine grass field.

RANGE IN CHARACTERISTICS: Reaction ranges from very strongly acid to medium acid.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, chroma of 2 to 4. Texture is sand, loamy sand or sandy loam.

The C horizon has hue of 10YR, 7.5YR or 2.5Y, value of 4 to 7 and chroma of 2 to 4. Texture is sand.

COMPETING SERIES: The Espinal series is the only soil in the same family. Espinal soils are calcareous below 16 to 24 inches of the surface.

GEOGRAPHIC SETTING: The Aguadilla soils occur on nearly level terrain along the coast at elevation close to sea level. The regolith consists of sand size volcanic fragments, quartz grains and shell fragments. The climate is tropical humid. The average annual precipitation is 80 inches and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Catano, Coloso and Espinal soils. The Catano soils are calcareous throughout and occur on beaches. The Coloso soils are finer textured, somewhat poorly drained and occur in the river flood plains. The Espinal soils are on similar topographic positions.

DRAINAGE AND PERMEABILITY: Excessively drained, slow runoff and very rapid permeability.

USE AND VEGETATION: These soils are used mostly for pasture and coconuts. Native vegetation consists of native grasses and shrubs.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1936.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 8 inches (Ap)

National Cooperative Soil Survey
U.S.A.

LOCATION AMELIA PR

Established Series
Rev. JLL/GRB
07/2001

AMELIA SERIES

The Amelia series consists of very deep, well drained, moderately permeable soils on mountain footslopes and alluvial fans. They formed in gravelly sediments that weathered from igneous rock. Near the type location, the mean annual precipitation is about 35 inches and mean annual temperature is about 79 degrees F. Slopes range from 2 to 12 percent.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplustalfs

TYPICAL PEDON: Amelia clay loam--pasture (Colors are for moist soil unless otherwise stated.)

Ap--0 to 9 inches; dark brown (7.5YR 3/4) sandy clay loam; moderate fine granular structure; soft, friable; slightly sticky, slightly plastic; common very fine roots;
about 5 percent, by volume, pebbles; slightly acid; clear wavy boundary. (5 to 11 inches thick)

Bt1--9 to 15 inches; dark reddish brown (5YR 3/4) clay loam; weak medium subangular blocky structure; slightly hard, friable; sticky, plastic; common very fine roots; common thin clay films on pebbles; about 25 percent, by volume, pebbles; neutral; clear smooth boundary.

Bt2--15 to 29 inches; yellowish red (5YR 4/6) gravelly clay; moderate fine and medium subangular blocky structure; firm; sticky, plastic; few very fine roots, many thin clay films on faces of peds, few thin clay films on gravel; about 15 percent, by volume, pebbles; neutral; gradual smooth boundary.

Bt3--29 to 43 inches; yellowish red (5YR 4/6); very gravelly clay; moderate medium subangular blocky structure; slightly hard, firm; sticky, plastic; few very fine roots; many thin clay films on faces of peds and few thin clay films on pebbles; about 40 percent, by volume, pebbles; about 2 percent, by volume, cobbles; neutral; clear wavy boundary.

Bt4--43 to 56 inches; about 75 percent strong brown (7.5YR 4/6) and about 25 percent yellowish red (5YR 4/6) very

gravelly sandy clay loam; weak medium subangular blocky structure; slightly hard, friable; sticky, plastic; few very fine roots; many thin clay films on faces of peds and on pebbles; about 50 percent, by volume, pebbles; about 5 percent, by volume, cobbles; neutral; gradual wavy boundary.

Bt5--56 to 68 inches; yellowish red (5YR 4/6) extremely gravelly sandy clay loam; weak medium subangular blocky structure; slightly hard, friable; sticky, plastic; common clay films on the vertical and horizontal faces of peds and on pebbles; about 65 percent, by volume, pebbles; about 5 percent, by volume, cobbles; neutral; gradual wavy boundary.

Bt6--68 to 78 inches; yellowish red (5YR 5/6) very gravelly sandy clay loam; weak medium subangular blocky structure; slightly hard, friable; sticky, plastic; common clay films on vertical and horizontal faces of peds and on rock fragments; about 45 percent, by volume, pebbles; about 2 percent, by volume, cobbles; neutral. (Combined thickness of Bt horizon ranges from 60 inches to more than 80 inches thick.)

TYPE LOCATION: Cabo Rojo Municipality, Puerto Rico. Approximately 3.3 miles west of P.R. highway 303 from the intersection with P.R. highway 305; about 1.4 miles west of the Maguayo community on dirt road, and about 80 feet south of the dirt road in native pasture. San German topographic quadrangle; lat. 18 degrees 07 minutes 46 seconds N.; long. 67 degrees 07 minutes 13 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 60 to more than 80 inches. Reaction is strongly acid to neutral in the A horizon and slightly acid or neutral in the Bt horizons.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 to 4. Texture is loam, clay loam, gravelly clay loam, or gravelly clay. Content of pebbles and cobbles range from 2 to 20 percent, by volume.

The Bt horizon has hue of 2.5YR to 10YR, value of 3 or 4, and chroma of 4 through 8. Texture in the upper Bt is very gravelly clay loam, very gravelly clay, gravelly clay loam or gravelly clay and in the lower Bt, clay loam, very gravelly clay loam, or extremely gravelly sandy clay loam. Content of pebbles and cobbles range from 20 to 75 percent by volume, averaging 40 to 70 percent in the control section.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: Amelia soils are on footslopes and alluvial fans. They formed in material that weathered from igneous rock. Slopes range from 2 to 12 percent. The climate is semiarid tropical. The average annual precipitation

ranges from 30 to 40 inches and the average annual temperature ranges from 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Descalabrado, Fraternidad, Guayama, Jacana, and Maguayo series. Descalabrado and Guayama soils are shallow to igneous bedrock. Jacana soils are moderately deep to igneous bedrock. In addition, they are on higher adjacent sideslopes of volcanic hills and mountains and have fewer pebbles and cobbles in the control section. The moderately well drained Fraternidad soils have smectitic mineralogy and fewer pebbles in the control section. Maguayo soils are on similar positions, contain secondary carbonates, and have fewer pebbles in the control section.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of Amelia soils are used for pastureland. A few small areas are in cropland, primarily corn and sorghum. Vegetation consists of Guineagrass, Pajon, and other native and introduced grasses and shrubs.

DISTRIBUTION AND EXTENT: Semiarid mountains and valleys of southern Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1936.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - zone from 0 to 9 inches (Ap horizon)

Argillic horizon - zone from 9 to 78 inches (Bt1, Bt2, Bt3, Bt4, Bt5, and Bt6 horizons)

ADDITIONAL DATA: Sampled as S85PR-079-003, S85PR-007-001 and S57PR-079-007. Samples by NSSL, Lincoln NE.

MLRA: 273.

National Cooperative Soil Survey
U.S.A.

LOCATION ARENALES PR

Established Series
Rev. GRB
06/2002

ARENALES SERIES

The Arenales series consists of very deep, excessively drained, rapidly permeable soils on flood plains and alluvial fans. They formed in stratified coarse sediments derived from volcanic and limestone rocks. Near the type location, the mean annual precipitation is about 42 inches and the mean annual temperature is about 79 degrees F. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Mixed, isohyperthermic Aridic Ustipsamments

TYPICAL PEDON: Arenales sandy loam - cultivated; sugarcane (colors are for moist soil.)

Ap--0 to 8 inches, very dark grayish brown (10YR 3/2) sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; many fine roots; common fine subrounded volcanic fragments; slightly alkaline; clear wavy boundary. (6 to 10 inches thick)

C1--8 to 24 inches, very dark grayish brown (10YR 3/2) loamy sand; single grain; loose; nonsticky, nonplastic; few fine roots; thin strata of dark grayish brown (10YR 4/2) loamy sand; moderately alkaline; abrupt smooth boundary.

C2--24 to 31 inches, very dark gray (10YR 3/2) coarse sand; single grain; loose, nonsticky, nonplastic; moderately alkaline; abrupt smooth boundary.

C3--31 to 42 inches, very dark grayish brown (10YR 3/2) sand; single grain; loose, nonsticky, nonplastic; slightly alkaline; clear smooth boundary.

2C--42 to 60 inches extremely gravelly coarse sand.

TYPE LOCATION: Sudeste SCD, Puerto Rico. Approximately 0.5 miles south and about 50 feet west of kilometer

marker 92.1 of Highway No. 1, near the town of Salinas.

RANGE IN CHARACTERISTICS: The 10 to 40 inch section of the profile is well graded, ranging from silts to coarse sand and gravel. Coarse fragments are less than 35 percent, by volume in the control section. Depth to the gravel and sand layer is 40 to 55 inches. Reaction ranges from slightly acid to moderately alkaline throughout.

The A horizon has hue of 7.5YR or 10YR, value of 3 and 4, and chroma of 1 through 4. Texture is loam or sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 3 to 5 and chroma of 2 to 6. Texture is sand, loamy sand, or their gravelly analogs.

The 2C horizon is extremely gravelly coarse sand or sand.

COMPETING SERIES: This is the Meros series in the same family. Meros soils are on benches along the coast and have poorly graded, well sorted soil materials dominated by sand-size sea shell and coral fragment.

GEOGRAPHIC SETTING: Arenales soils are on flood plains and alluvial fans. They formed in stratified, coarse-textured sediments derived from volcanic and limestone rocks. Slopes range from 0 to 2 percent. The climate is semiarid tropical. The average annual precipitation ranges from 35 to 50 inches and the average annual air temperature ranges from 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Guamani, Jacaguas, San Anton, and Vayas series which occur in the flood plain. Guamani soils are on similar positions but have a cambic horizon and a control section that is loamy in the upper part and gravelly in the lower part. Jacaguas soils are on similar topographic positions close to the streams but have mollic epipedons and more than 35 percent coarse fragments throughout. The well drained San Anton soils are on slightly higher positions and have mollic epipedons. The poorly drained Vayas soils are on lower positions and are clayey.

DRAINAGE AND PERMEABILITY: Excessively drained; rapid permeability.

USE AND VEGETATION: Many areas are used for the production of sugarcane and pastureland. Vegetation includes guineagrass and other native and introduced species.

DISTRIBUTION AND EXTENT: Semiarid flood plains and alluvial fans of southern Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Survey Area, Puerto Rico; September 1969.

REMARKS: These soils were included in the San Anton series in the 1942 Soil Survey of Puerto Rico.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon: zone from 0 to 8 inches (Ap horizon)

MLRA: 271, 273.

National Cooperative Soil Survey
U.S.A.

LOCATION BAJURA PR

Established Series
Rev. RER
06/2002

BAJURA SERIES

The Bajura series consists of deep poorly drained, slowly permeable soils on river flood plains. They formed in sediments of mixed origin. Slopes range from 0 to 2 percent. Mean annual precipitation is 84 inches and the mean annual temperature is 78 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Vertic Endoaquolls

TYPICAL PEDON: Bajura clay - sugarcane
(Colors are for moist soil)

Ap--0 to 6 inches, very dark grayish brown (10YR 3/2) clay; massive; hard, firm, slightly sticky, plastic; many fine roots; common fine black concretions; few pressure faces; medium acid; clear smooth boundary. (4 to 8 inches thick)

Bw--6 to 12 inches, very dark grayish brown (2.5Y 3/2) clay, many medium distinct gray (N 6/) and few medium distinct reddish brown (5YR 4/4) mottles; weak fine and medium subangular blocky structure; very firm, sticky, plastic; common fine roots; common fine black concretions; few pressure faces; medium acid; gradual smooth boundary. (4 to 10 inches thick)

Bg1--12 to 32 inches, dark gray (N 4/) clay, many medium distinct dark greenish gray (5BG 4/1) and few medium distinct brown (7.5YR 4/4) mottles; weak medium angular blocky structure; very firm, sticky, plastic; few fine roots; few pressure faces; medium acid; gradual smooth boundary. (15 to 25 inches thick)

Bg2--32 to 60 inches, dark greenish gray (5BG 4/1) clay, few fine distinct brown (7.5YR 4/4) mottles; weak medium angular blocky structure; very firm, sticky, plastic; few fine roots; few slickensides and pressure faces; medium acid.

TYPE LOCATION: Suroeste SCD, Puerto Rico; 2 miles northwest of the town of Cabo Rojo; 500 feet northeast on

old railroad from kilometer marker 3.2 of highway 103. 50 feet north of old railroad.

RANGE IN CHARACTERISTICS: Solum thickness is more than 60 inches. The soil is medium acid and slightly acid throughout. The soil has cracks 1/2 to 2 inches wide to a depth of 30 inches during dry seasons in most years. Some polypedons are saline.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silty clay or clay.

The Bw horizon has hue of 2.5Y, value of 3 to 6, and chroma or 0 to 2. It is clay and has few to many mottles.

The Bg horizon has hue of 2.5Y to 5BG, value of 4 or 5, and chroma of 0 to 2. It is clay and has few to many mottles.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: The Bajura soils are nearly level soils on river flood plains with slopes of 0 to 2 percent. The soils formed on fine textures sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 84 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Coloso, Dique, Igualdad, Maunabo, Santoni and Toa soils all of which are on river flood plains. Coloso soils are somewhat poorly drained and lack cracks. Dique soils are well drained and lack cracks. Igualdad soils have clayey over sandy or sandy-skeletal particle-size control sections. Maunabo soils do not have shrink-swell properties. Santoni soils are calcareous. Toa soils are well drained and moderately well drained and have a mollic epipedon.

DRAINAGE AND PERMEABILITY: Poorly drained, slow run-off, slow permeability.

USE AND VEGETATION: Most of the acreage is planted to sugarcane but some areas are used for growing pasture.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent with about 13,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico. (San Juan Soil Survey Area), 1972.

REMARKS: These soils were formerly included with the Coloso series, poorly drained phase.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedons - zone from 0 to 6 inches (Ap horizons)

Vertic property - cracks and pressure faces and slickensides.

National Cooperative Soil Survey
U. S. A.

LOCATION CAGUABO PR

Established Series
Rev. GRB
06/2002

CAGUABO SERIES

The Caguabo series consists of shallow, well drained soils on side slopes of strongly dissected uplands. They formed in material that weathered from igenous rocks. Near the type location, the mean annual precipitation is about 80 inches and the mean annual temperature is 76 degrees F. Slopes range from 5 to 70 percent.

TAXONOMIC CLASS: Loamy, mixed, active, isohyperthermic, shallow Typic Eutrudepts

TYPICAL PEDON: Caguabo clay loam - native pasture and weeds. (Colors are for moist conditions.)

Ap--0 to 4 inches; dark grayish brown (10YR 4/2) clay loam; weak fine granular structure; friable, slightly sticky, slightly plastic; about 10 percent, by volume, igneous rock fragments; common fine roots; slightly acid; clear smooth boundary. (2 to 5 inches thick)

Bw--4 to 10 inches; brown (10YR 4/3) very gravelly clay loam; weak fine subangular blocky structure parting to weak fine granular; friable, slightly sticky, slightly plastic; about 60 percent, by volume, igneous rock fragments; few fine roots; slightly acid; clear smooth boundary. (4 to 8 inches thick)

C--10 to 16 inches; mixture of weathered and partially weathered igneous rock fragments and saprolite that can be penetrated with the spade. (0 to 7 inches thick)

R--16+ inches; consolidated igneous rock.

TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately 1.5 miles northwest of the town of Anasco; about 300 feet north of intersection of Highways 2 and 110.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 6 to 20 inches and depth to bedrock ranges from

10 to 20 inches. The soil is slightly acid throughout.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 6. Texture is loam, clay loam, or their gravelly analogs.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 2 to 6, and chroma of 3 to 6. Texture is gravelly to extremely analogs of silty clay loam, clay loam, or clay. Content of saprolite ranges from 0 to 20 percent, by volume.

The C horizon, where present, has hue of 7.5YR to 2.5Y, value of 2 to 6, and chroma of 3 to 6; or it has no dominant matrix color and is multicolored. Texture is gravelly or very gravelly analogs of sandy clay loam or clay loam. Content of saprolite ranges from 20 to 60 percent, by volume.

The Cr horizon, where present, is saprolite that is similar in color and texture as the C horizon.

The R layer is consolidated igneous rock.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Caguabo soils are on lower positions of strongly dissected volcanic uplands at elevations below 1,800 feet or 550 meters. Slope range from 5 to 70 percent. They formed in fine-textured residuum or partially weathered igneous rocks. The climate is humid tropical. The average annual precipitation ranges from 75 to 85 inches and the average annual temperature ranges from 75 to 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Juncos, Mabi, Maraquez, Maresua, Morado, Mucara, and Quebrada soils. All of these soils are deeper to bedrock. In addition, the Juncos, Mabi, and Mucara soils are have clayey, smectitic control sections. The Maraguez and Morado soils and have fine-loamy, mixed control sections. Maresua soils have mixed, clayey-skeletal control sections. Quebrada soils have mixed, clayey control sections.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of this soil are used for pasture. A few small areas are planted to woodland. Vegetation consists of native and introduced grasses, shrubs, and trees.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Survey Area, Puerto Rico; 1969.

REMARKS: These soils were formerly included in the Mucara series.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - the zone from 0 to 4 inches (Ap horizon).

Cambic horizon - the zone from 4 to 10 inches (Bw horizon).

Lithic contact - hard bedrock at 16 inches (R layer).

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION CANDELERO PR

Established Series
Rev. BCD
07/2001

CANDELERO SERIES

The Candelero series consists of very deep, somewhat poorly drained, slowly permeable soils on terraces, alluvial fans, and footslopes. They formed in sediments derived from granitic rocks. Slopes range from 0 to 12 percent. The mean annual precipitation is about 87 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, active, isohyperthermic Typic Albaqualfs

TYPICAL PEDON: Candelero loam - sugarcane. (Colors are for the moist soil)

Ap--0 to 7 inches, dark grayish brown (10YR 4/2) loam; weak fine granular structure; very friable; few fine roots; few fine black mineral grains; few concretions 2 to 3 mm in diameter; extremely acid; clear smooth boundary. (5 to 10 inches thick)

Bt1--7 to 11 inches, gray (10YR 6/1) and yellowish brown (10YR 5/8) sandy clay loam, purplish mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; few roots; thin discontinuous gray (10YR 6/1) films on surfaces of peds; black coatings in root channels; common fine quartz grains; extremely acid; clear smooth boundary. (3 to 6 inches thick)

Bt2--11 to 15 inches, gray (10YR 6/1) and yellowish brown 5/6) sandy clay loam; weak medium subangular blocky structure; very firm, slightly sticky, plastic; few roots; thin discontinuous gray (10YR 6/1) films on surfaces of peds; dark films in root channels; common fine quartz grains; few fine black mineral grains; many weathered feldspar and hornblende crystals; very strongly acid; gradual smooth boundary. (3 to 10 inches thick)

Btg1--15 to 24 inches, greenish gray (5GY 6/1) sandy clay loam, common medium distinct brownish yellow (10YR 6/6) mottles; few fine distinct reddish brown mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; few roots; thin discontinuous greenish gray (5GY 6/1) films on surfaces of peds; dark films in root channels; many

fine quartz grains; many weathered feldspar and hornblende crystals; strongly acid; gradual smooth boundary. (6 to 15 inches thick)

Btg2--24 to 35 inches, light greenish gray (5GY 7/1) sandy clay loam; common fine distinct greenish gray mottles, common medium distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure; very firm, slightly sticky, slightly plastic; thin discontinuous light greenish gray (5GY 7/1) films on surfaces of peds, gray tends to run in vertical tongues; many fine quartz grains; few fine black mineral grains; many weathered feldspar and horneblend crystals; slightly acid; clear smooth boundary. (0 to 10 inches thick)

BC--35 to 64 inches, dark yellowish brown (10YR 4/4) sandy clay loam, common medium distinct yellowish brown (10YR 5/6) mottles; common fine distinct greenish gray mottles; massive; friable, slightly sticky; many fine quartz grains; many weathered feldspar crystals; common fine black mineral grains; slightly acid.

TYPE LOCATION: Yabucoa, Puerto Rico; 260 feet southwest from km. marker 1.9, Highway 905, and 30 feet northwest of unpaved farm road.

RANGE IN CHARACTERISTICS: Depth to the bottom of the Bt horizon ranges from 25 to 42 inches. The soil is extremely acid or very strongly acid in the A horizon, very strongly acid or strongly acid in the upper part of the Bt horizon, and medium acid or slightly acid in the BC horizon. Few to many quartz grains are mixed throughout the soil. The mean annual soil temperature ranges from 72 to 80 degrees F.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 to 3. It is loam, sandy loam, or sandy clay loam.

The upper part of the Bt horizon has hues of 10YR to 5Y values of 4 to 6, and chroma of 1 to 8. The lower part of the Bt horizon has hues of 10YR to 5GY, values of 3 to 7, and chroma of 0 to 2. They are sandy clay loam, sandy clay, or clay loam. The Bt horizons have weak, medium or coarse subangular blocky or prismatic structures.

The BC horizon has hues of 10YR to 5Y, values of 4 to 6 and chroma of 1 to 8. It is sandy clay loam to clay and silty clay.

COMPETING SERIES: There are no other known series in the same family.

The Cayagua and Vega Baja series are similar soils in a related family. Both of these soils have a fine particle-size control

section.

GEOGRAPHIC SETTING: The Candelero soils are nearly level to sloping soils on terraces, alluvial fans and footslopes. Slopes range from 0 to 12 percent. The soils formed in moderately fine textured sediments high in quartz, feldspar and hornblende minerals derived from granitic rocks. The climate is humid tropical. Average annual rainfall is 87 inches, and average annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Humacao, Mayo and Parcelas soils. The Humacao and Parcelas soils lack dominant low chroma colors and lack an argillic horizon. The Mayo soils have less than 18 percent clay, lack low chroma colors, have thick dark A horizons, lack argillic horizons and occur on footslopes and fans at higher elevations.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained. Runoff is medium and permeability is slow.

USE AND VEGETATION: Most of the acreage is cultivated and used for growing sugarcane. The small uncultivated areas are in Pangola or Guinea grass and are used for pasture.

DISTRIBUTION AND EXTENT: Humid plutonic areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, 1942.

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Aeric Tropaqualfs to Fine-loamy, mixed, isohyperthermic Typic Albaqualfs. The previous OSED date was 3/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 7 inches (Ap horizon)

Argillic horizon - zone from 7 to 35 inches (Bt and Btg horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION CARTAGENA PR

Established Series
Rev. LAD-RLV
08/2000

CARTAGENA SERIES

The Cartagena series consists of very deep, somewhat poorly drained, slowly permeable soils that formed in sediments derived from volcanic rocks and limestone. These nearly level soils are on alluvial fans in valleys. Slopes range from 0 to 2 percent. The mean annual precipitation is about 35 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Sodic Haplusterts

TYPICAL PEDON: Cartagena clay - cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) clay, weak fine angular blocky structure; firm, slightly sticky, plastic, common fine roots; few fine black concretions; neutral (pH 6.6), clear wavy boundary. (5 to 9 inches thick)

ABss1--7 to 15 inches; very dark grayish brown (10YR 3/2) clay; moderate medium angular blocky structure; firm, slightly sticky, plastic, common fine roots, few fine volcanic fragments; few small slickensides; few fine black concretions; neutral (pH 6.9), clear wavy boundary. (6 to 10 inches thick)

ABss2--15 to 22 inches; very dark gray (10YR 3/1) clay; moderate fine angular blocky structure; firm slightly sticky, plastic; few fine roots; few fine black concretions; few fine volcanic fragments; many slickensides and pressure surfaces; neutral (pH 7.3); wavy boundary. (6 to 9 inches thick)

ABss3--22 to 30 inches; black (10YR 2/1) clay; weak coarse angular blocky structure; firm; slightly sticky; plastic; few fine volcanic fragments; many slickensides and pressure surfaces; mildly alkaline (pH 7.6); clean irregular boundary. (6 to 12 inches thick)

Bss1--30 to 46 inches; dark grayish brown (10YR 4/2) clay; weak coarse angular blocky structure; firm; sticky, plastic; common fine black concretions; many fine subrounded volcanic fragments; common slickensides and pressure surfaces;

moderately alkaline (pH 8.2) gradual wavy boundary. (10 to 20 inches thick)

Bss2--46 to 60 inches; brown (10YR 4/3) clay; weak coarse angular blocky structure; firm; sticky, plastic, common fine black concretions; few fine subrounded volcanic fragments; effervescent; moderately alkaline (pH 8.4).

TYPE LOCATION: Suroeste SCS, Puerto Rico, 2.2 mile southeast of the town of Lajas, 0.6 mile northeast of Hacienda Beatriz Soledad, 5/8 mile south of Highway No. 117, 1.5 miles east of junction of old railroad and Highway No. 116 in northwest corner of farm road intersection.

RANGE IN CHARACTERISTICS: Depth to moderate salinity is 18 to 26 inches.

The A horizon has hue of 10YR or 2.5Y and value of 2 or 3 moist. Texture is clay or silty clay loam.

The ABss horizon has hue of 10YR or 2.5Y and value of 2 or 3 moist. Texture is clay or silty clay loam. This horizon is slightly to moderately saline.

The Bss horizon has hue of 7.5YR, 10YR or 2.5Y, value of 2 through 5, and chroma of 2 through 4. Slickensides are common to many and are close enough to intersect. It is moderately saline. ESP is 15 to 35.

COMPETING SERIES: This is the Fe series in same subgroup. Fe soils have gypsum crystals in the subsoil and have montmorillonitic mineralogy.

GEOGRAPHIC SETTING: Cartagena soils are on alluvial fans in valleys. Slope is 0 to 2 percent. These soils formed in sediments derived from volcanic rocks and limestone. Elevation is near sea level. The climate is tropical semiarid. Mean annual precipitation is 30 to 45 inches, and the mean annual temperature is 76 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the competing Fe soils, these are the Aguirre, Fraternidad, Guanica, Paso Seco and Santa Isabel soils. Aguirre soils have a very dark gray or black surface layer. Fraternidad soils are moderately well drained. Guanica soils have gypsum crystals at depths of 32 to 50 inches. Paso Seco soils have a lithologic discontinuity of gravelly material at depths of 28 to 35 inches. Santa Isabel soils have a very dark gray or black surface layer and are moderately well drained.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; slow permeability.

USE AND VEGETATION: This soil is mainly used for sugar cane and pasture. The native vegetation consists mainly of Angletongrass, Paraguita and Rayo and Mesquite bushes.

DISTRIBUTION AND EXTENT: Coastal plains of southern Puerto Rico. The soils of this series are of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Lajas Valley Area, Puerto Rico; 1961

REMARKS: The classification was previously updated with the 4/91 draft from Fine, mixed, isohyperthermic Udic Chromusterts to Fine, mixed, isohyperthermic Typic Chromusterts. The previous OSED date was 4/85.

Diagnostic horizons and features recognized in this pedon:

Mollic epipedon - zone from 0 to 30 inches (A and ABss horizons)

Slickensides and vertic features - zone from 7 to 60 inches (ABss and Bss horizons)

ADDITIONAL DATA: Sampled as S57PR-14-5 and S57PR-14-8. NSSL, Lincoln, NE Lab. Sample Nos. 7403-7409 and 7419-7425, Nov. 1966.

National Cooperative Soil Survey
U.S.A.

LOCATION CATANO PR

Established Series
Rev. REG
04/2000

CATANO SERIES

The Catano series is excessively drained, rapidly permeable upland soils. These soils are deep, calcareous, brown sands having more than 4 percent silt plus clay in the control section.

TAXONOMIC CLASS: Carbonatic, isohyperthermic Typic Udipsamments

TYPICAL PEDON: Catano sand--coconut grove.
(Colors are for moist soil.)

A1--0 to 4 inches; light gray (10YR 7/2) sand sized shell fragments, and very dark brown (10YR 2/2) subrounded grains of quartz and miscellaneous volcanic rock fragments with organic matter coatings; overall color is very dark grayish brown (10YR 3/2); single grain; loose, nonsticky, and nonplastic; many fine roots; strong effervescence; clear smooth boundary. (3 to 6 inches thick)

AC--4 to 10 inches; dark brown (overall color) (10YR 3/3) sand and more than 4 percent silt plus clay consisting of light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous volcanics; single grain; loose, nonsticky, and nonplastic; common fine roots; strong effervescence; clear smooth boundary. (4 to 8 inches thick)

C1--10 to 50 inches; brown (overall color) (10YR 4/3) sand and more than 4 percent silt plus clay consisting of light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous subrounded volcanic; singly grain; loose, nonsticky and nonplastic; few fine roots; strong effervescence; clear smooth boundary. (30 to 60 inches thick)

C2--50 to 60 inches; grayish brown (10YR 5/2) (overall color) sand; single grain; loose, nonsticky and nonplastic; very few fine roots; strong effervescence.

TYPE LOCATION: Oeste SCD, Puerto Rico; 2 miles north of the city of Mayaguez; 1/2 mile on dirt road North of

Boquilla bridge, 300 feet East of dirt road.

RANGE IN CHARACTERISTICS: The sandy materials extend to depth of more than 5 feet. Texture of the whole profile is sand. The sand consists of shell fragments, quartz grains, and volcanic subrounded fragments. Percent of silt plus clay in the control section varies from 4 to 10. These soils are single grain, nonsticky, and nonplastic throughout. Effervescence with dilute HCL varies from slight to violent.

Overall colors of the A and AC horizons have hues of 10YR and values and chromas of 2 to 3.

The C horizons have hues of 10YR, values of 4 and 5, and chromas of 2 and 3.
COMPETING SERIES: These are the St. Lucie (P.R.), Aguadilla, Espinal, Arenales, Meros, and Jaucas series. The St. Lucie (P.R.) soils have sands with more than 95 percent quartz. The Aguadilla soils are acid. The Espinal soils have noncalcareous A horizons and lighter colored C horizons. The Arenales, Meros, and Jaucas soils are dry for more than 90 cumulative days in most years. The Arenales and Meros soils are noncalcareous. The Jaucas soils have lighter colored profile.

GEOGRAPHIC SETTING: The Catano soils occur along the coast at elevations close to sea level with slope gradients from 0 to 5 percent. The regolith consists of sand size shell fragments, quartz grains, and miscellaneous volcanic subrounded fragments. The climate is humid tropical. The average annual precipitation is 76 inches and the mean annual temperature is 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and winter temperatures.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Aguadilla, St. Lucie (P.R.), and Espinal series in addition to the Corcega, and Coloso series and the land type coastal Beach. The Corcega and Coloso soils are finer textured, have low chroma mottles, and occur farther inland. The land type coastal Beach consists of unstabilized wave reworked narrow strips of sand along the coast.

DRAINAGE AND PERMEABILITY: Excessively drained; runoff is very slow, and permeability is rapid.

USE AND VEGETATION: Mostly on coconuts and undergrowth of pasture. Small acreage is in subsistence crops.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1942; Soil Survey of Puerto Rico.

National Cooperative Soil Survey
U. S. A.

LOCATION CAYAGUA PR

Established Series
Rev. RLV
07/2001

CAYAGUA SERIES

The Cayagua series have dark grayish brown, moderately coarse textured, granular A horizons, light brownish gray, mottled, fine textured B horizons over moderately coarse textured, mottled yellowish red and gray C horizons.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Aeric Albaqualfs

TYPICAL PEDON: Cayagua sandy loam - pasture (Colors are for the moist soil)

Ap--0 to 4 inches, dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; many fine roots; few medium iron concretions between Ap and Bt1; strongly acid; abrupt smooth boundary (2 to 6 inches thick).

Bt1--4 to 10 inches, light brownish gray (10YR 6/2) clay with many coarse distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very firm slightly sticky, plastic; common fine roots; patchy clay films on ped surfaces and root channels; very strongly acid; clear wavy boundary (4 to 8 inches thick).

Bt2--10 to 20 inches, light brownish gray (10YR 6/2) clay with many coarse distinct strong brown (7.5YR 5/6) and few fine distinct red (2.5YR 5/6) mottles; weak coarse angular blocky structure; firm, slightly sticky, plastic; few fine roots; thin patchy clay films on ped surfaces and root channels; very strongly acid; clear wavy boundary (8 to 12 inches thick)

BC--20 to 27 inches, sixty percent yellowish red (5YR 5/6) sandy loam; massive; friable, nonsticky, nonplastic; 40 percent light gray (10YR 7/1) clay; massive; friable, nonsticky plastic; few fine roots; very strongly acid; gradual wavy boundary (4 to 10 inches thick)

C1--27 to 36 inches, sixty percent by volume yellowish red (5YR 4/6) sandy loam; massive; friable, nonsticky, nonplastic; 40 percent light gray (10YR 7/1) clay; massive friable, nonsticky, plastic; quartz seams in the clayey sections;

very strongly acid; gradual wavy boundary (6 to 12 inches thick)

C2--36 to 100 inches, yellowish red (5YR 4/6) and reddish yellow (7.5YR 6/6) sandy loam; massive; very friable, nonsticky, nonplastic; slightly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 3.0 miles northwest of the town of Humacao, 450 feet west of kilometer marker 0.7, Highway No. 953 (75 feet west of fence).

RANGE IN CHARACTERISTICS: Thickness of the solum varies from 18 to 36 inches. Mean annual soil temperature at 20 inches is 72 degrees F. or more with less than 9 degrees F. difference between mean summer and mean winter soil temperatures. Mineralogy is mixed. Base saturation (by sum of cations) is 35 percent or more at 50 inches below the top of the argillic horizon. The surface textures vary from clay loam to sandy loam.

The A horizon has colors in hues of 10YR and 2.5Y, values of 3 and 4, chroma of 2 to 4.

The matrix colors of the Bt horizons are in hues of 10YR and 2.5Y, values of 4 to 7, chroma of 2 or less. Mottles range from common to many, fine to coarse, strong brown, yellowish brown and red. Reaction varies from strongly to very strongly acid. Clay film range from thin patchy to thin continuous. The Bt horizon ranges in thickness from 12 to 20 inches and in texture from clay to sandy clay.

The BC and C1 horizons have matrix colors in hues of 7.5YR or 5YR, values of 4 to 6 and chroma of 4 to 8. The mottles are light to grayish brown. Reaction ranges from strongly to very strongly acid. The C2 horizon ranges in texture from sandy loam to sandy clay loam and in reaction from moderately acid to neutral.

COMPETING SERIES: There are no series in the same family. Soils in similar families include the Fajardo, Vega Baja, and Candelero series. The Fajardo and Vega Baja soils have finer textured A and C horizons. The Fajardo soils have redder mottles and stronger structure in the argillic horizon. The Vega Baja soils have clayey horizons below the argillic horizon and endosaturation. The Candelero soils have coarser textured argillic horizons.

GEOGRAPHIC SETTING: The Cayagua soils occur on gently to strongly sloping footslopes and sideslopes with slope gradients from 2 to 20 percent. The regolith consists of residuum derived from coarse textured plutonic rocks. The climate is humid tropical. The mean annual precipitation is from 80 to 90 inches. The mean annual temperature is from 76 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the similar Candelero series, these are the Mayo, Pandura, Ingenio, and Limones series. The Candelero soils occupy alluvial fans in positions below the Cayagua soils and are also poorly drained. The Mayo soils occupy footslopes and alluvial fan positions below Cayagua soils and are well to excessively drained. The Pandura soils occur on steep sideslopes in positions overlying the Cayagua soils and are shallow over the plutonic rocks. The Ingenio and Limones soils are red, well drained and occupy positions in sideslopes and hilltops above the Cayagua soils.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained, slow runoff, slow permeability.

USE AND VEGETATION: The major use is for the production of sugarcane. Many areas have been planted to Pangola and other adapted grasses and used as pasture. The native vegetation is mostly native grasses and shrubs.

DISTRIBUTION AND EXTENT: Humid plutonic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1936.

REMARKS: The Cayagua series was formerly classified in the Gray Brown Podzolic soil group of the 1938 Soil Classification. This update changes the classification from Ochraqualfs to Epiaqualfs.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon)

Argillic horizon - zone from 4 to 20 inches (Bt horizon)

MLRA = 270

SIR = PR0032

National Cooperative Soil Survey
U.S.A.

LOCATION COAMO PR

Established Series
Rev. GRB
06/2002

COAMO SERIES

The Coamo series consists of very deep, well drained, moderately permeable soils on alluvial fans and terraces. They formed in material that weathered from volcanic and limestone rocks. Near the type location, the mean annual temperature ranges from 78 to 80 degrees F., and the mean annual precipitation ranges from 30 to 40 inches. Slopes range from 1 to 5 percent.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Typic Argiustolls

TYPICAL PEDON: Coamo clay loam. (Colors are for moist soil unless otherwise stated.)

A1--0 to 5 inches; very dark brown (10YR 2/2) very dark grayish brown (10YR 3/2) dry, clay loam; weak medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; few fine roots; few fine pebbles; slightly acid; diffuse wavy boundary.

A2--5 to 15 inches; very dark brown (10YR 2/2) very dark grayish brown (10YR 3/2) dry, clay loam; weak coarse subangular blocky structure; slightly hard, friable; slightly sticky, slightly plastic; few fine roots; few fine pebbles; slightly acid; clear smooth boundary. (Combined thickness of the A horizons ranges from 8 to 12 inches)

Bt--15 to 25 inches; dark brown (7.5YR 4/2) dark brown (7.5YR 3/2) dry, clay; weak medium subangular blocky structure; very hard, firm; slightly sticky, slightly plastic; common fine pebbles; few distinct clay films along root channels and vertical cleavage planes; few faint splotches of secondary calcium carbonate; slightly alkaline; gradual wavy boundary. (8 to 15 inches thick)

Bk--25 to 38 inches; dark brown (10YR 3/3) dark brown (7.5YR 4/2) dry, gravelly clay; weak medium subangular blocky structure; very hard, firm; slightly sticky, slightly plastic; peds coated with secondary calcium carbonate; moderately alkaline; clear smooth boundary. (10 to 20 inches thick)

2C--38 to 48 inches; stratified layers of pebbles and gravelly clay loam; pebbles ranging in size from 0.5 to 2.0 inches in diameter; common fine dark minerals; common fine lime coatings of secondary calcium carbonate; moderately alkaline.

TYPE LOCATION: Salinas, Puerto Rico. Approximately 1.7 miles south of Km. 85.1 on Highway No. 1, Salinas to Cayey.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 24 to 42 inches. Soil reaction ranges from slightly acid to neutral in the surface horizon and from slightly alkaline to moderately alkaline in the subsoil. Depth to the calcic horizon ranges from 20 to 36 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. Texture is dominantly clay loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 6. Texture is dominantly clay.

The Bk or BCk horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 6. Texture is gravelly clay or clay.

The 2C horizons consists of stratified layers of pebbles and gravelly to extremely sandy to clay loams.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Coamo soils are on alluvial fans and terraces. They formed in sediments derived from volcanic and limestone rocks that are underlain by materials from moderately coarse to coarse. The climate is tropical semiarid. Slopes range from 1 to 5 percent. The average annual temperature ranges from 78 to 80 degrees F., and the average annual rainfall ranges from 30 to 40 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Amelia, Descalabrado, Jancana, and San Anton series. Amelia soils are on similar to slightly higher positions, are clayey-skeletal, and do not have mollic epipedons. Descalabrado soils are on higher positions and are shallow to hard volcanic rock. Jacana soils are on similar to slightly higher positions and are moderately deep. San Anton soils are on adjacent lower flood plains and have weakly developed cambic horizons.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of Coamo soils are used as pasture. Vegetation consists of introduced native grasses and shrubs.

DISTRIBUTION AND EXTENT: Semiarid sections of southern Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico; 1936.

REMARKS: The classification was updated with the 4/91 draft from Fine, mixed, isothermic Typic Argiustolls to Fine, mixed, isohyperthermic Typic Argiustolls. The previous OSED was dated 7/65.

Diagnostic horizons and features recognized in this pedon:

Mollic epipedon - the zone from 0 to 15 inches (A1 and A2 horizons).

Argillic horizon - the zone from 15 to 25 inches (Bt horizon).

Calcic horizon - the zone from 25 to 38 inches (Bk horizon).

National Cooperative Soil Survey
U.S.A.

LOCATION COLOSO PR

Established Series
Rev. GRB
10/2001

COLOSO SERIES

The Coloso series consists of very deep, somewhat poorly drained, slowly permeable soils on flood plains and terraces. They formed in stratified loamy and clayey alluvial sediments. Near the type location, the mean annual precipitation is about 80 inches and the mean annual air temperature is about 78 degrees F. Slopes range from 0 to 8 percent.

TAXONOMIC CLASS: Very-fine, kaolinitic, acid, isohyperthermic Aeric Endoaquepts

TYPICAL PEDON: Coloso silty clay loam - sugarcane. (Colors are for moist soil.)

Ap--0 to 7 inches; brown (10YR 4/3) silty clay loam; weak medium granular structure; firm, slightly sticky, plastic; many fine roots; few worm holes; slightly acid; clear smooth boundary. (5 to 12 inches thick)

Bw--7 to 13 inches; brown (10YR 4/3) silty clay loam, weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few worm holes; few fine black (10YR 2/1) concretions; common fine distinct yellowish red (5YR 4/6) masses of iron accumulation and common fine faint light gray (10YR 7/2) areas of iron depletion; slightly acid; clear smooth boundary. (0 to 10 inches thick)

Cg1--13 to 33 inches; about 50 percent dark gray (10YR 4/1) and 50 percent light gray (5Y 7/1) silty clay loam; massive; firm, slightly sticky, plastic; few fine roots; few worm holes; common fine black (10YR 2/1) concretions; many medium distinct reddish brown (5YR 4/3) masses of iron accumulation; the areas in colors of dark gray and light gray are iron depeletions; slightly acid; gradual smooth boundary. (15 to 25 inches thick)

Cg2--33 to 60 inches; dark gray (10YR 4/1) silty clay; massive; firm, slightly sticky, plastic; few fine roots; few worm holes; common fine black (10YR 2/1) concretions; many fine faint yellowish brown (10YR 5/8) masses of iron accumulation and common fine distinct greenish gray (5GY 5/1) areas of iron depletion; slightly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately one kilometer west of the town of Anasco; about 250 meters west of kilometer marker 145.5 of Highway 2, and fifty feet north of farm road.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 7 to 22 inches. Rock fragments range from 0 to 10 percent by volume throughout the profile. Reaction ranges from moderately acid to slightly acid throughout the profile.

The A or Ap horizon have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silty clay loam or silty clay.

The Bw horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Redoximorphic features in shades of red, yellow, brown, or gray range from few to many. Texture is silty clay loam, silty clay, or clay.

The C horizons have hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 to 4. Redoximorphic features in shades of red, yellow, or brown range from few to many. Texture is silty clay loam, silty clay, or clay.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Coloso soils are on river flood plains and terraces. They formed in stratified loamy and clayey alluvial sediments of mixed origin. Slopes range from 0 to 8 percent. The climate is humid tropical. The average annual precipitation ranges from 78 to 82 inches and the mean annual air temperature is 77 to 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Bajura, Corcega, Dique, and Toa series. The poorly drained Bajura soils have mixed mineralogy and Vertic subgroups. Corcega soils are fine-loamy over sandy or sandy-skeletal. The well drained Dique soils are fine-loamy. The well drained Toa soils have mixed mineralogy and a Mollic epipedon.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow permeability.

USE AND VEGETATION: Most areas of Coloso soils are used for sugarcane production. Some areas are used for pasture. A few areas are in woodland consisting of native and introduced species.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon.

Ochric epipedon - the zone from 0 to 7 inches (Ap horizon).

Cambic horizon - the zone from 7 to 13 inches (Bw horizon).

Aquic feature - apparant water table; 2 to 4 feet; July through September.

ADDITIONAL DATA: Rio Grande Municipality, Puerto Rico; S93PR-119-009 and S93PR-119-012. Samples by NSSL, Lincoln, NE.

MLRA: 270, 272.

National Cooperative Soil Survey
U.S.A.

LOCATION CORCEGA PR

Established Series
Rev. REG:LHR
06/2002

CORCEGA SERIES

The Corcega series consists of brown, granular, moderately fine textured A horizons and mottled, weakly developed moderately fine textured B horizons over dark gray sands.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, semiactive, nonacid, isohyperthermic Fluvaquentic Endoaquepts

TYPICAL PEDON: Corcega silty clay loam - sugarcane. (Colors are for moist soil.)

Ap--0 to 8 inches; dark brown (10YR 4/3) silty clay loam; weak medium granular structure; firm, slightly sticky, slightly plastic; many fine roots; slightly acid; clear smooth boundary. (6 to 12 inches thick)

B2--8 to 14 inches; dark brown (10YR 4/3) silty clay loam with common fine prominent yellowish red (5YR 4/6) and few fine distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; common fine black concretions; slightly acid; clear smooth boundary. (5 to 8 inches thick)

B3--14 to 32 inches; dark gray (10YR 4/1) sandy clay loam with common fine distinct reddish brown (5YR 4/3) and common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine black concretions; few fine roots; slightly acid; clear smooth boundary. (13 to 20 inches thick)

IIC--32 to 50 inches plus; dark gray (10YR 4/1) sand; single grain; loose, nonsticky and nonplastic; slightly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico; 2 miles west of the town of Anasco; 40 meters west of kilometer marker 2.0 on Highway 115.

RANGE IN CHARACTERISTICS: Depth to the sands varies from 24 to 40 inches. Depth to water table varies from

10 to 36 inches.

Colors of the A horizons have hues of 10YR and values of 3 and 4.

The B horizons have colors in hues of 10YR, values of 4 and chromas of 2 and 4. The B horizons have few to common mottles of yellowish red, reddish brown, light gray and gray colors. Structure of the B horizons ranges from weak fine to medium subangular blocky.

The C horizons have colors in hues of 10YR and 2.5Y, values of 4 and chromas of 1 and 2 and mottles of reddish brown, yellowish brown and gray colors. Silty clay loam is the dominant type. These soils have slightly sticky and slightly plastic sola. Reaction ranges from slightly to medium acid.

COMPETING SERIES: These are the Maunabo, Vayas, Fortuna, Playa, Bajura, Santoni, Josefa, Talante, Coloso, and Pinones series. The Maunabo and Fortuna soils are acid, lack the sandy C horizons, and are finer textured throughout. The Playa, Bajura and Santoni soils are darker, finer textured, and have low chroma mottles higher in the profile. The Josefa soils are more acid. The Vayas soils are finer textured throughout and saline in the lower horizons. The Coloso soils are finer textured and do not have sandy C horizons. The Talante soils are more acid. The Pinones soils have buried organic materials within 20 inches of the surface.

GEOGRAPHIC SETTING: The Corcega soils occupy nearly level areas in the river flood plains. The regolith consists of moderately fine textured sediments of mixed origin over sands. The climate is humid tropical. The average annual rainfall is 80 inches and the mean annual temperature is 78 degrees F. Mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and mean winter temperature.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Playa, Bajura, Santoni, and Coloso series in addition to Toa and Dique soils both lacking low chroma mottles in the upper profile and the sands in the C horizons.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained, runoff is slow and permeability is moderate.

USE AND VEGETATION: Sugarcane.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

REMARKS: The Corcega series was formerly classified in the Alluvial Great Soil Group. It is being revised and placed in the New System of Soil Classification.

National Cooperative Soil Survey
U. S. A.

LOCATION DAGUAO PR

Established Series
Rev. BCD
06/2002

DAGUAO SERIES

The Daguao series consists of moderately deep, well drained, moderately slowly permeable soils on sideslopes in mountains. They formed in moderately fine and fine textured residuum derived from volcanic rocks. Slopes range from 20 to 40 percent. The mean annual precipitation is about 82 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Daguao clay. (Colors are for moist soil unless otherwise noted.)

A--0 to 8 inches; very dark gray (10YR 3/1) clay; weak fine granular structure; very firm, slightly sticky, plastic; strongly acid; gradual wavy boundary. (4 to 12 inches thick)

Bt1--8 to 13 inches; dark yellowish brown (10YR 4/4) clay; weak coarse subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films; strongly acid; gradual wavy boundary. (4 to 10 inches thick)

Bt2--13 to 21 inches; yellowish brown (10YR 5/4) clay; moderate coarse subangular blocky structure; firm; slightly sticky, slightly plastic; clay films on vertical ped faces, few clay films on horizontal ped faces; few partly weathered hornblende crystals; few pressure faces and small slickensides; strongly acid; clear wavy boundary. (6 to 12 inches thick)

Cr--21 to 34 inches; yellowish brown (10YR 5/6), yellowish red (5YR 4/6), and dark greenish gray (5GY 4/1) saprolite; many hornblende crystals.

R--34 inches plus; dark greenish consolidated acid volcanic rock.

TYPE LOCATION: Naguabo, Puerto Rico; 150 feet north of Km. marker 0.55 and of intersection of Highways 31 and 3.

RANGE IN CHARACTERISTICS: The solum is 14 to 26 inches thick. Depth to consolidated volcanic rock is 20 to 40 inches. Few to many fine to medium size dark hornblende fragments are throughout the soil. Soil reaction ranges from strongly acid to very strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 and chroma of 1 or 2. It is clay or silty clay.

The Bt horizon has hue of 10YR, 7.5YR or 5YR, value of 4 or 5 and chroma of 4 to 8.

COMPETING SERIES: This is the Naranjito series is the same family. The Naranjito soils have redder hue in the Bt horizon and do not contain Hornblende fragments.

GEOGRAPHIC SETTING: The Daguao soils are on moderately steep to steep mountains. Slopes range from 20 to 60 percent. The regolith consists of moderately fine to fine-textured residuum weathered from volcanic rocks that are very high in hornblende. The climate is humid tropical. Average annual rainfall is 80 to 85 inches, and average annual temperature is 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are in the Ejemplo, Laura, Naranjito, and Pandura series. The Ejemplo soils are on footslopes and fans below the Daguao soils. The Pandura soils occur on similar slopes but have grayer colors, coarser textures, and less well expressed Bt horizons. The Laura soils on low rolling granite hills are deeper, coarser in texture, and have less well expressed Bt horizons that are redder in color. The Naranjito soils have less well expressed structure in the Bt horizon and are redder in color.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is rapid. Permeability is moderately slow.

USE AND VEGETATION: The soil is largely in native grasses and brush and is used for pasture. A small part is cultivated.

DISTRIBUTION AND EXTENT: Humid parts of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, l936.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Typic Tropohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED was dated 4/87.

Diagnostic horizons and features recognized in this pedon are:

Umbric epipedon - zone from 0 to 8 inches (A horizon)

Argillic horizon - zone from 8 to 21 inches (Bt horizons)

Paralithic contact at 21 inches (Cr layer)

Lithic contact - at 34 inches (R layer)

National Cooperative Soil Survey
U.S.A.

LOCATION DESCALABRADO PR

Established Series
Rev. GRB
06/2002

DESCALABRADO SERIES

The Descalabrado series consists of shallow, well drained, moderately permeable soils on uplands. They formed in material weathered from basic volcanic rock. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 2 to 60 percent.

TAXONOMIC CLASS: Clayey, mixed, superactive, isohyperthermic, shallow Typic Haplustolls

TYPICAL PEDON: Descalabrado clay loam--pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 5 inches; dark brown (10YR 3/3) clay loam; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable; slightly sticky and slightly plastic; common fine roots; about 10 percent, by volume, angular pebbles of volcanic rock; neutral; clear smooth boundary. (4 to 8 inches thick)

Bw--5 to 12 inches; dark brown (7.5YR 3/2) gravelly clay; weak fine subangular blocky structure; slightly hard, firm; slightly sticky and slightly plastic; few fine roots; about 30 percent, by volume, angular pebbles of volcanic rock; neutral; clear wavy boundary. (6 to 12 inches thick)

R--12 inches; hard basic volcanic rock; few seams of secondary carbonates in cracks in upper part.

TYPE LOCATION: Lajas Valley, Puerto Rico. Approximately 0.3 miles east of km. 13.1, Highway 103 and about 132 feet north of cement marker AFF No. 38 on edge of main irrigation canal.

RANGE IN CHARACTERISTICS: Depth to bedrock ranges from 10 to 20 inches. Rock fragments range from 0 to 30 percent in the A and Bw horizons. Reaction ranges from slightly acid to slightly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam or their gravelly or

cobbly analogs.

The Bw horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam, clay, or their gravelly or cobbly analogs.

Some pedons have a thin Cr layer composed of highly fractured volcanic rock. Colors are similar to the Bw horizon.

The R layer is hard, basic volcanic rock.

COMPETING SERIES: There are no known competing series in the same family.

GEOGRAPHIC SETTING: Descalabrado soils are on hills and mountains. They formed in material that weathered from basic volcanic rock. The climate is tropical semiarid. Slopes are 2 to 60 percent. The average annual temperature ranges from 77 to 81 degrees F., and the average annual precipitation ranges from 30 to 40 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Aguilita, Guayama, Jacana, and Juana Diaz soils. Aguilita soils are generally on lower positions, are deep to limestone bedrock and are carbonatic. Guayama soils are on similar positions, have argillic horizons, and do not have a mollic epipedon. Jacana soils are on slightly lower positions and are moderately deep to volcanic rock. Juana Diaz soils are on similar positions, are shallow to semiconsolidated sandstone, and do not have mollic epipedons.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas are used for pastureland. A few areas are used for crops including corn, tobacco, pigeon peas, avocado, and mangos. Vegetation includes guineagrass, buffelgrass, and other native and introduced species.

DISTRIBUTION AND EXTENT: Semiarid uplands of southern Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: St. Croix, Virgin Islands, 1932.

REMARKS: The original concept of this series was 15 to 35 inches of residuum over volcanic bedrock as mapped by Dr. James Thorp during the first 1932 soil survey of St. Croix. This soil was correlated as a Lithic Vertic Ustropept in the 1970 Soil Survey of the Virgin Islands. The type location was moved to Lajas Valley, Puerto. This series was not correlated in the USVI soil survey update.

Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - zone from 0 to 12 inches (Ap and Bw horizons).

Cambic horizon - zone from 5 to 12 inches (Bw horizons).

Lithic contact - at 12 inches (R layer).

ADDITIONAL DATA: Sampled as S61PR-14-8. Sample by NSSL, Lincoln, NE.

National Cooperative Soil Survey
U.S.A.

LOCATION FAJARDO PR

Established Series
Rev. BCD
06/2002

FAJARDO SERIES

The Farjardo series consists of very deep, somewhat poorly drained, slowly permeable soils. They formed in fine textured sediments of mixed origin. These nearly level to moderately steep soils are on alluvial fans and terraces in coastal plains. Slopes range from 2 to 10 percent. The mean annual precipitation is about 77 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Chromic Epiaquerts

TYPICAL PEDON: Fajardo clay - sugarcane. (Colors are for the moist soil).

Ap--0 to 9 inches; dark grayish brown (10YR 4/2) clay; common fine faint gray (10YR 5/1) mottles; weak medium subangular blocky parting to moderate medium granular structure; firm, slightly sticky, slightly plastic; many fine roots; few fine fragments of volcanic rocks; common fine black concretions; medium acid; abrupt smooth boundary. (7 to 12 inches thick)

Bt1--9 to 14 inches; yellowish brown (10YR 5/6) clay; many medium distinct greenish gray (5GY 6/1) and many medium prominent red (2.5 YR 4/6) mottles; moderate medium subangular blocky structure; very firm, sticky, plastic; common fine roots; many prominent clay films on faces of peds and in root channels; common fine black concretions; slightly acid; gradual smooth boundary. (4 to 8 inches thick)

Bt2--14 to 25 inches; yellowish brown (10YR 5/6) clay; many medium prominent gray (5Y 6/1) and red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very firm, sticky, plastic; common fine roots; few faint clay films on faces of peds and in root channels; common slickenslides and pressure faces; common fine black concretions; medium acid; gradual smooth boundary. (8 to 14 inches thick)

Bt3--25 to 36 inches; red (2.5YR 4/6) clay; many medium prominent light gray (N 7/0), common medium prominent

dark red (2.5YR 3/6) and common medium prominent yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; very firm, sticky, plastic; few fine roots; common slickensides and pressure faces; few fine dark concretions; medium acid; gradual smooth boundary. (7 to 11 inches thick)

Bt4--36 to 48 inches; yellowish brown (10YR 5/6) clay; many medium prominent gray (N 6), light bluish gray (5B 7/1), and dark red (2.5YR 3/6) mottles; weak, fine, subangular blocky structure; very firm, sticky, plastic; medium acid; gradual smooth boundary. (10 to 14 inches thick)

Bt5--48 to 60 inches plus; gray (N 6/0) clay; many medium distinct dark red (2.5YR 3/6) yellowish brown (10YR 5/6), light bluish gray (5B 7/1) mottles; weak, fine, subangular blocky structure; very firm, sticky, plastic; medium acid.

TYPE LOCATION: Humacao Survey Area, Puerto Rico, Land Authority farm, 5500 feet south and 40 feet west from entrance to Luquillo Public Beach on Highway 3.

RANGE IN CHARACTERISTICS: Thickness of the solum is more than 60 inches. CEC/100 grams of clay is more than 24 meq in the major part of the argillic horizon. The soil ranges from medium acid to strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 through 4.

The upper Bt horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. Mottles range from common to many and are gray, red, and dark red. Slickensides and pressure faces range from few to common. The lower Bt horizon has variegated colors including gray, yellowish brown, red, and dark red. In some pedons the lower part of the B horizon contains soft plinthite, but the amount is less than 5 percent by volume.

COMPETING SERIES: This is the Rio Arriba series in the same family. The Rio Arriba soils lack mottles of low chroma in the upper 40 inches.

GEOGRAPHIC SETTING: The Fajardo soils are on alluvial fans and coastal plains. Slope gradients range from 0 to 12 percent. The soil formed in fine textured sediments of mixed origin. The climate is humid topical. The average annual precipitation is 75 to 80 inches, and the mean annual temperature is 77 to 80 degrees. F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Coloso, Rio Piedras, Toga, Vega Alta, Vega Baja, and Yunes series. The Coloso and Toa soils are browner and occupy positions in the river floodplains below the Farjardo

soils. The Rio Piedras and Yunes soils are on steep sideslopes above the Fajardo soils and lack mottles of low chroma. The Vega Alta soils lack mottles of low chroma and have more than 5 percent by volume of nonindurated plinthite. The Vega Baja soils have dominant colors of 2 or lower chroma.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained. Runoff is slow and permeability is slow.

USE AND VEGETATION: Most of the soil is in sugarcane and pasture.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The classification was updated with the 4/91 draft from Fine, mixed, isohyperthermic Vertic Tropudalfs to Fine, mixed, isohyperthermic Aquic Paleudalfs. No cracking was described in this pedon to allow it to classify as a Vertic subgroup even though it has some properties of a Vertisol. The previous OSED date was 7/87

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - zone from 0 to 9 inches. (Ap horizon)

Argillic horizons - zone from 9 to 60 inches. (Bt horizons)

Pale clay curve - less than 20 percent clay cutback throughout the Bt horizons.

National Cooperative Soil Survey
U.S.A.

LOCATION FORTUNA PR

Established Series
Rev. LHR
06/2002

FORTUNA SERIES

The Fortuna series consists of plastic, clayey soils with olive gray A horizons and greenish gray, mottled B and C horizons.

TAXONOMIC CLASS: Fine, mixed, active, acid, isohyperthermic Fluvaquentic Endoaquepts

TYPICAL PEDON: Fortuna clay - sugarcane field. (Colors are for moist soil.)

Ap--0 to 5 inches; olive gray (5Y 4/2) clay; few fine faint greenish gray and few fine prominent strong brown mottles; massive; very firm, slightly sticky, slightly plastic; common fine roots; strongly acid; abrupt smooth boundary. (4 to 9 inches thick)

B2lg-- 5 to 9 inches; dark greenish gray (5GY 4/1) clay; common medium prominent strong brown (7.5YR 5/8) mottles; massive; very firm, slightly sticky, plastic; common fine roots; few fine rock fragments; strongly acid; abrupt smooth boundary. (3 to 8 inches thick)

B22g--9 to 18 inches; greenish gray (5GY 5/1) clay; many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; common fine roots; few fine black concretions; strongly acid; gradual smooth boundary. (7 to 12 inches thick)

B3g--18 to 30 inches; greenish gray (5GY 5/1) clay; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; few fine roots; dark coatings in root channels; strongly acid; gradual smooth boundary. (8 to 16 inches thick)

Cg--30 to 77 inches plus; greenish gray (5GY 5/1) clay; many coarse prominent yellowish brown (10YR 5/8) mottles; massive, very firm, sticky, plastic; very strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 2.0 kilometers south Naguabo, 10 kilometers northeast of Humacao, 2.1 kilometers north of bridge on Anton Ruiz river on Highway 3, near abandoned railroad.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 22 to 45 inches. The reaction of all horizons is strongly or very strongly acid.

Color of the A horizon is dark grayish brown (10YR 4/2; 2.5Y 4/2) through olive brown (2.5Y 4/4); dark yellowish brown (10YR 4/4) or olive gray (5Y 4/2) through olive (5Y 4/4). Texture is clay or silty clay. Structure is weak subangular blocky, weak granular or massive. The B horizon has colors of dark grayish brown (2.5Y 4/2) through light brownish gray (2.5Y 6/2) or dark gray (2.5Y 4/; 5Y 4/1), gray (5/ , N6/ ; 5Y 5/1, 6/1) or dark greenish gray (5GY, 5G, 5BG 4/1) through greenish gray (5GY, 5G, 5GB, 6/1). Mottles are common or many and chromas range from 1 through 8. Texture is silty clay or clay. The structure is weak subangular blocky or massive. Black concretions are few or common.

The C horizon has dominant colors with hues of 5Y, and 5GY through 5BG; values of 4 through 7; and chromas of 2 or less. Mottles are common or many and chromas are 1 through 8. Texture is clay or silty clay.

COMPETING SERIES: These are the Bajura, Coloso, Corcega, Igualdad, Maunabo, Perchas, Pinones, Reparada, Santoni, Talante, and Vayas soils. The Bajura, Igualdad, and Vayas soils have control sections with pH values of 5.5 or more. The Coloso, Corcega and Talante soils have subhorizons with dominant colors with chromas of 3 or more within 30 inches of the surface. The Maunabo and Perchas soils have organic matter content that decreases regularly with depth. The Pinones and Reparada soils have organic layers within 30 inches of the soil surface. The Santoni soils are calcareous.

GEOGRAPHIC SETTING: The Fortuna soils occur on nearly level flood plains with slope gradients of 0 to 2 percent. The regolith is clayey sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Bajura, Caloso, and Maunabo soils and the Toa, Dique, and Reilly soils. Dique soils have fine-loamy control sections. Reilly soils have sandy-skeletal control sections. Toa soils have mollic epipedons and are not dominanted by gray colors.

DRAINAGE AND PERMEABILITY: Poorly drained. Runoff is slow. Permeability is slow.

USE AND VEGETATION: Most areas are used for growing sugarcane.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: These soils were formerly classified in the Alluvial great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION FRATERNIDAD PR

Established Series
Rev. GRB
03/2000

FRATERNIDAD SERIES

The Fraternidad series consists of very deep, moderately well drained, slowly permeable soils on coastal plains. They formed in clayey sediments derived from volcanic rock and limestone. Near the type location, the mean annual temperature is about 77 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 0 to 12 percent.

TAXONOMIC CLASS: Fine, smectitic, isohyperthermic Typic Haplusterts

TYPICAL PEDON: Fraternidad clay. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) clay; moderate fine granular structure; firm; slightly sticky and plastic; many fine roots; few siltstone pebbles less than 15 mm in diameter; slightly acid; abrupt smooth boundary. (4 to 7 inches thick)

ABss--6 to 12 inches; very dark grayish brown (10YR 3/2) clay; moderate coarse prismatic structure breaking to very weak coarse angular or wedge-shaped blocks; very hard, firm; plastic, slightly sticky; many fine roots; many large slickensides having polished and grooved surfaces; common siltstone pebbles 2 to 15 mm in diameter; few small soft black (10YR 2/1) bodies; slightly acid; clear wavy boundary. (40 to 50 inches thick)

BAss--12 to 24 inches; brown (10YR 4/3) clay with pockets of very dark grayish brown (10YR 3/2) clay; weak coarse angular or wedge-shaped peds breaking to small and medium angular peds; very hard, firm; plastic, slightly sticky; common fine roots; many large intersecting slickensides having polished and grooved surfaces; few small soft black (10YR 2/1) bodies; slightly effervescent, slightly alkaline; clear wavy boundary. (6 to 23 inches thick)

Bss--24 to 50 inches; brown (10YR 4/3) clay with pockets of sandy clay loam; large angular or wedge shaped intersecting peds; very hard, firm; plastic, slightly sticky; many large slickensides having polished and grooved surfaces;

few to common small soft black (10YR 2/1) bodies; common fine and medium light gray (10YR 7/2) splotches of lime, strongly effervescent; moderately alkaline.

TYPE LOCATION: Lajas Valley, Puerto Rico. Approximately 690 feet north and 150 feet east of junction of road to poultry barns east of Lajas Experiment Station headquarters.

RANGE IN CHARACTERISTICS: Solum thickness is more than 60 inches. Reaction ranges from slightly acid to slightly alkaline in the A, Ap, and ABss horizons, and from slightly alkaline to moderately alkaline in the Bass and Bss horizons. When dry, this soil has cracks ranging from 0.5 to 3 inches in width extending to depths greater than 20 inches. In pasture this soil has pronounced gilgai relief. The typifying pedon is at the center of a microknoll.

The A, AP, and ABss horizons have moist values of 2 or 3. Texture is clay loam or clay.

The BAss horizon has hue of 10YR or 2.5Y, moist value of 3 through 5, and chroma of 2 through 4. Texture is clay.

The Bss horizon has hue of 10YR or 2.5Y, moist value of 4 or 5, and chroma of 3 through 6. Texture is clay.

COMPETING SERIES: The Santa Isabel series is the only known series in the same family. Santa Isabel soils are on similar positions but are not calcareous in any part.

GEOGRAPHIC SETTING: Fraternidad soils are on coastal plains. They formed in clayey sediments derived from volcanic rocks and limestone. The climate is tropical semiarid. Slopes range from 0 to 12 percent. The average annual temperature ranges from 76 to 78 degrees F., and the average annual precipitation ranges from 30 to 35 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: Aguirre, Cartagena, Fe, Guanica, and Paso Seco soils. Aguirre, Cartagena, Fe, and Guanica soils are somewhat poorly drained. In addition, Aguirre soils are on lower positions, have more clay in the subsoil, and are sodic. Cartagena soils are on similar positions, have mixed mineralogy, and are sodic. Fe soils are on slightly higher positions, and are sodic. Guanica soils are on slightly lower positions and have more clay in the subsoils. The moderately well drained Paso Seco soils have a lithologic discontinuity with very gravelly loamy material below depths of 28 to 35 inches.

DRAINAGE AND PERMEABILITY: Moderately well drained; slow permeability.

USE AND VEGETATION: Fraternidad soils are used for pasture and cultivated crops including sugarcane, rice, fruit, and vegetable crops. The vegetation consists of guineagrass, buffelgrass, and other native and introduced species.

DISTRIBUTION AND EXTENT: Coastal plains of southern Puerto Rico. The soils of this series are moderately extensive.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico; 1936.

REMARKS: The classification was previously updated with the 4/91 draft from Fine, montmorillonitic, isohyperthermic Udic Chromusterts to Fine, montmorillonitic, isohyperthermic Typic Chromusterts. The present definition in Soil Taxonomy for Udic-ustic soil moisture regimes is mutually exclusive. The previous OSED date for this series was 7/84.

A gypsum substratum phase is recognized. Depth to gypsum is 30 to 40 inches. Electrical conductivity is 0 to 2 millimohs per centimeter in the A horizons, 2 to 4 millimohs per centimeter in the BAss horizon and in the upper part of the Bss horizon, and 8 to 16 millimohs per centimeter in the lower part of the Bss horizon. Depth to moderate salinity is 30 to 40 inches.

A gravelly substratum phase is also recognized. Depth to the gravelly layer is 20 to 36 inches.

Diagnostic horizons and features recognized in this pedon:

Mollic epipedon - zone from 0 to 11 inches (Ap and ABss horizons).

Slickensides and vertic features - zone from 6 to 50 inches (ABss, BAss and Bss horizons).

ADDITIONAL DATA: NSSL S61PR-14-9. Sample by NSSL, Lincoln, NE.

National Cooperative Soil Survey
U.S.A.

LOCATION GUAMANI PR

Established Series
Rev. GRB
06/2002

GUAMANI SERIES

The Guamani series consists of very deep, well drained, rapidly permeable soils on flood plains. They formed in medium-textured sediments over sand, pebbles, and cobbles derived from volcanic and limestone rocks. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 40 inches. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Torrifluventic Haplustepts

TYPICAL PEDON: Guamani silty clay loam - sugar cane. (Colors are for moist soil.)

Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak fine subangular blocky separating to fine granular structure; friable; slightly plastic, slightly sticky; many fine roots; few fine pores; few fine rock fragments; slightly acid; gradual smooth boundary. (4 to 8 inches thick)

Bw--6 to 20 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; slightly plastic, slightly sticky; common fine roots; common fine pores; few rock fragments and gravel; slightly acid; abrupt wavy boundary. (11 to 26 inches thick)

2C-20+ inches; sand, pebbles, and cobbles.

TYPE LOCATION: Sudeste SCD, Puerto Rico, Highway 3, between Guayama and Salinas; about 100 feet west to kilometer marker 144.3.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 15 to 34 inches. Reaction ranges from slightly acid to slightly alkaline throughout.

The A or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is loam, silt loam, silty clay loam, or clay loam.

The Bw horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Texture is loam, silty clay loam, or clay loam.

The 2C horizon is a mixture of sand, pebbles, and cobbles. Stratified layers of loamy fine sand, sandy loam, or loam are present in some pedons.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Guamani soils are on river flood plains of southern Puerto Rico. They formed in medium-textured sediments over sand, pebbles, and cobbles derived from volcanic and limestone rocks. The climate is tropical semiarid. Slopes range from 0 to 2 percent. The average annual temperature ranges from 78 to 80 degrees F., and the average annual rainfall ranges from 35 to 45 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Aguirre, Arenales, Fraternidad, San Anton, and Vayas soils. The somewhat poorly drained Aguirre and moderately well drained Fraternidad soils are on higher positions and have clayey, smectitic control sections. Arenales soils are on similar positions, have sandy control sections, and lack cambic horizons. San Anton soils are on slightly higher positions, have mollic epipedons, and fine-loamy subsoils. The poorly drained Vayas soils are on lower positions and have clayey subsoils.

DRAINAGE AND PERMEABILITY: Well drained; rapid permeability.

USE AND VEGETATION: Most areas of Guamani soils are used for cropland and pasture. Vegetation consists of guineagrass and other native and introduced grasses.

DISTRIBUTION AND EXTENT: In the semiarid river flood plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Sudeste Soil Conservation District, Puerto Rico; l969.

REMARKS: The Guamani series was formerly classified in the Alluvial great soil group.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from 0 to 6 inches.

Cambic horizon - the zone from 6 to 20 inches.

Below 20 inches - stratified layers of sand, pebbles, and cobbles.

MLRA: 271 and 273.

National Cooperative Soil Survey
U.S.A.

LOCATION GUAYABOTA PR

Established Series
Rev. GRB
07/2001

GUAYABOTA SERIES

The Guayabota series consists of shallow, poorly drained, slowly permeable soils on side slopes of deeply dissected mountains of volcanic origin. They formed in material weathered from andesitic to basaltic, marine deposited, metamorphosed volcanic silt stone. Near the type location, the mean annual rainfall is about 185 inches and the mean annual temperature is about 72 degrees F. Slopes range from 5 to 80 percent.

TAXONOMIC CLASS: Clayey, mixed, subactive, acid, isothermic, shallow Typic Humaquepts

TYPICAL PEDON: Guayabota silty clay loam - forest. (Colors are for moist conditions.)

A--0 to 5 inches; very dark gray (5Y 3/1) silty clay loam; weak fine subangular blocky structure; slightly sticky; slightly plastic; many fine and medium roots; few fine and medium interstitial pores; few fine reddish brown (5YR 4/4) pore linings; very strongly acid; clear smooth boundary. (3 to 6 inches thick)

Bg1--5 to 11 inches; dark olive gray (5Y 3/2) silty clay; weak coarse subangular blocky structure breaking to weak medium subangular blocky; firm, slightly sticky, slightly plastic; common fine and medium roots; few fine vesicular and tubular pores; many fine dark reddish brown (5YR 3/4) and few medium distinct yellowish brown (10YR 5/8) masses of iron accumulation; common medium distinct dark bluish gray (5B 4/1) areas of iron depletions; very strongly acid; gradual smooth boundary.

Bg2--11 to 14 inches; dark olive gray (5Y 3/2) silty clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; about 5 percent, by volume, weathered siltstone fragments; common coarse distinct yellowish brown (10YR 5/8) and few medium distinct yellowish red (5YR 5/8) masses of iron accumulation; few fine distinct dark gray (10YR 4/1) areas of iron depletions; extremely acid; abrupt smooth boundary. (Combined thickness of the Bg horizons ranges from 4 to 9 inches)

Cg--14 to 18 inches; about 34 percent dark bluish gray (5B 4/1); about 33 percent dark greenish gray (5G 4/1), and about 33 percent yellowish red (5YR 4/8) silty clay loam; massive, friable, slightly sticky, slightly plastic; few fine and medium roots; few fine pores; about 50 percent, by volume, saprolite; the areas in shades of yellowish red are areas of iron accumulation and the areas in shades of dark bluish gray and greenish gray are iron depletions; extremely acid; abrupt smooth boundary. (3 to 5 inches thick)

R--18 inches; dark bluish gray (5B 4/1) and greenish gray (5G 4/1) hard siltstone bedrock.

TYPE LOCATION: Noreste SCD, Caribbean National Forest, Puerto Rico. Approximately 300 feet northwest from kilometer marker 11.8 of Highway 191 to Glorieta Bohique, then about 150 feet south. El Yunque topographic quadrangle; lat. 18 degrees 18 minutes 22 seconds N.; long. 65 degrees 47 minutes 05 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Depth to the hard siltstone bedrock ranges from 10 to 20 inches. Reaction ranges from extremely acid to strongly acid throughout the profile.

The Oi horizon, where present, is composed of fine, medium, and coarse roots that from a mat up to 5 inches thick.

The A horizon has hue of 2.5Y to 5B, value of 2 to 4, and chroma of 3 or less; or it is neutral with value of 2 to 4. Texture is silty clay loam or silty clay.

The Bg horizon has hue of 2.5Y to 5B, value of 3 to 5, and chroma of 2 or less; or it is neutral with value of 3 to 5. Texture is silty clay loam, clay loam, or silty clay. Redoximorphic features in shades of brown, yellow, red, and gray range from few to common.

The Cg horizon, where present, has colors similar to the Bg horizon. Texture is silty clay loam or silty clay. Saprolite ranges from 40 to 70 percent, by volume.

The R layer is hard siltstone bedrock.

COMPETING SERIES: There are no competing series in the same family.

GEOGRAPHIC SETTING: Guayabota soils are on side slopes of strongly dissected volcanic uplands. Slopes range from 5 to 80 percent. The climate is humid tropical. The average annual rainfall ranges from 180 to 190 inches and the

average annual temperature ranges from 71 to 73 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Ciales, Los Guineos, Picacho, Utauado, and Yunque series. All of these series which lack hard bedrock within a 20 inch depth. Ciales soils are on ridge tops and upper side slopes, are very deep, and have argillic horizons. The well drained Los Guineos soils are Oxisols, on steep side slopes, and are very deep. The moderately well drained Picacho soils occur in upper sideslopes, are very deep, and have argillic horizons. The well drained Utuado soils are on similar positions and are fine-loamy. The moderately well drained Yunque soils are on ridge tops, are fine-loamy, and have argillic horizons.

DRAINAGE AND PERMEABILITY: Poorly drained; slow permeability.

USE AND VEGETATION: All of this soil is in native forest land that is used for recreation and research. Vegetation consists of Sierra palms, tree ferns, and other native and introduced species.

DISTRIBUTION AND EXTENT: Tropical rain forests of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Este SCD, Puerto Rico.

REMARKS: Diagnostic horizons and features recognized in this pedon.

Ochric epipedon - the zone from 0 to 5 inches (A horizon).

Cambic horizon - the zone from 5 to 14 inches (Bg horizons).

Lithic contact - hard bedrock at 18 inches (R layer).

Aquic feature - these soils are saturated with water most of the year. Water moves freely down slope along soil and rock contact.

Water table - 0.5 to 1.5 feet; perched; January through December.

Hydric soil indicators - F4.

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION GUAYAMA PR

Established Series
Rev. JLL/GRB
06/2002

GUAYAMA SERIES

The Guayama series consists of shallow, well drained, moderately permeable soils on uplands. They formed in material that weathered from igneous rock. Near the type location, the mean annual precipitation is 35 inches and the mean annual temperature is 79 degrees F. Slopes range from 5 to 60 percent.

TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic, shallow Typic Haplustalfs

TYPICAL PEDON: Guayama very gravelly clay loam--pasture. (Color are for moist soil unless otherwise stated.)

A--0 to 5 inches; dark reddish brown (5YR 3/4) very gravelly clay loam; weak fine granular structure; friable; slightly sticky, plastic, many fine roots; about 40 percent, by volume, pebbles; neutral; clear smooth boundary. (2 to 8 inches thick)

Bt--5 to 12 inches; reddish brown (5YR 4/4) gravelly clay; moderate fine subangular blocky structure; friable; sticky, plastic; common fine roots; few faint clay films on faces of peds; coarse fragments coated with clay; about 25 percent, by volume, pebbles; neutral; clear smooth boundary. (4 to 9 inches thick)

BC--12 to 18 inches; yellowish red (5YR 4/6) very gravelly clay loam; weak fine subangular blocky structure; firm; slightly sticky, plastic; few fine roots; about 40 percent, by volume, pebbles; neutral; gradual irregular boundary. (2 to 6 inches thick)

R--18 inches; igneous bedrock; common coatings of secondary lime are in cavities and fractures.

TYPE LOCATION: Cabo Rojo Municipality, Puerto Rico. Approximately 0.7 miles southeast on P.R. Hwy 303 from the intersection of P.R. Hwy 301 and P.R. Hwy 303 on dirt road; about 200 feet southeast of dirt road. Cabo Rojo topographic quadrangle; lat. 17 degrees 59 minutes 23 seconds N.; long. 67 degrees 08 minutes 55 seconds W.; PRD

1940.

RANGE IN CHARACTERISTICS: Depth to semiconsolidated volcanic rock is 10 to 20 inches. Reaction is slightly acid to slightly alkaline throughout the profile.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is loam, clay loam, gravelly clay loam, or very gravelly clay loam.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay loam, clay loam, clay, gravelly clay loam, or gravelly clay.

The BC horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is clay loam, gravelly clay loam, or very gravelly clay loam.

The R layer is igneous bedrock. Coatings of secondary lime in fractures and cavities range from none to many.

COMPETING SERIES: There are no other series in the same family.

GEOGRAPHIC SETTING: The Guayama soils are on side slopes and ridges of dissected uplands. They formed in material that weathered from igneous bedrock. Slopes range from 5 to 60 percent. The climate is tropical semiarid. The average annual precipitation ranges from 30 to 40 inches and the average annual temperature ranges from 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Aguilita, Amelia, Jacana, and Maguayo soils. Aguilita soils have a mollic epipedon and are shallow to soft limestone bedrock. Amelia soils are very deep and have clayey-skeletal control sections. Jacana soils are moderately deep and have vertic properties. Maguayo soils are very deep and have secondary carbonates in the profile.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of Guayama soils are used as pasture. Vegetation includes Guinea grass, Pajon, Buffel grass, and other native and introduced grasses and shrubs.

DISTRIBUTION AND EXTENT: Semiarid uplands of Puerto Rico. This series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 5 inches (A horizon).

Argillic horizon - zone from 5 to 12 inches (Bt horizon).

Lithic contact - zone at 18 inches (R layer).

MLRA: 271.

National Cooperative Soil Survey
U.S.A.

LOCATION HUMACAO PR

Established Series
Rev. RAB:LHR:JEW
08/2000

HUMACAO SERIES

The Humacao series consists of deep, well drained soils formed in sediments derived from weathered volcanic rocks. They are gently sloping soils on terraces. Humacao soils have loam A horizons over sandy clay loam and clay loam B and C horizons.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Typic Hapludolls

TYPICAL PEDON: Humacao loam - sugar cane
(Colors are for the moist soil)

Ap--0 to 14 inches, dark brown (7.5YR 3/2) loam, few medium distinct brown (10YR 4/3) mottles; weak fine and medium granular structure; friable, nonsticky, slightly plastic; many fine roots; 2 percent fine subrounded rock fragments; many fine quartz crystals; few fine dark minerals; medium acid; clear smooth boundary. (8 to 18 inches thick)

B2--14 to 18 inches; brown (10YR 4/3) sandy clay loam, tongues of dark brown (7.5YR 3/2); weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; 5 percent fine subrounded rock fragments; common fine quartz crystals; common fine dark minerals; medium acid; clear smooth boundary. (4 to 10 inches thick)

C1--18 to 31 inches; yellowish brown (10YR 5/4) clay loam, common medium faint dark yellowish brown (10YR 4/4) mottles; massive; firm, slightly sticky, slightly plastic; few fine roots; common fine quartz crystals; 5 percent fine subrounded partially weathered rock fragments; few fine dark concretions; medium acid; clear smooth boundary. (8 to 16 inches thick)

C2--31 to 60 inches; yellowish brown (10YR 5/6) clay loam, many medium prominent dark brown (10YR 3/3) and common medium distinct yellowish red (5YR 5/8) mottles; massive; friable, slightly sticky, slightly plastic; few fine quartz crystals; 5 percent fine partially weathered rock fragments; common medium dark concretions; slight acid.

TYPE LOCATION: Este SCD, Puerto Rico; 0.1 mile south of kilometer marker 1.2 or Highway 908, 10 feet west of farm road.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 12 to 28 inches. Mean annual soil temperature ranges from 76 to 80 degrees F. Coarse fragment content ranges from 0 to 10 percent throughout. The soils are medium acid or slightly acid throughout. Base saturation of the soil ranges from 50 to 80 percent.

The A horizons have hues of 7.5YR or 10YR, values of 2 or 3, and chroma of 2 or 3. They are loam.

The B horizons have hues of 5YR to 7.5YR, values of 4 to 6, and chroma of 3 to 8. They are sandy clay loam, heavy loam or clay loam. They have weak fine to medium subangular blocky structure.

The C horizons have hues of 5YR to 7.5YR, values of 4 to 6, and chroma of 4 to 8. They are sandy clay loam, heavy loam or clay loam. They are massive.

COMPETING SERIES: There are no other known series in the same family.

The Dique, Estacion, Maraquez, Morado, Parasol, and Toa series are similar soils in related families. Dique, Maraquez, and Morado soils have ochric epipedons. Estacion and Toa soils have and argillic horizon and ustic moisture regimes.

GEOGRAPHIC SETTING: The Humacao soils are gently sloping on terraces above the river flood plains with slope gradients of 2 to 5 percent. The soils formed in medium and moderately fine textured sediments derived form soils of plutonic parent materials. The climate is humid tropical. The average annual rainfall ranges from 85 to 90 inches and the mean annual temperature from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Candelero, Coloso, Ingenio, Jaqueyes, Limones, Maunabo, and Vivi soils. Candelero soils are somewhat poorly drained. Coloso, Maunabo, and Vivi soils are on river flood plains. Ingenio, Jaqueyes, and Limones soils are on sideslopes of the uplands at higher elevations.

DRAINAGE AND PERMEABILITY: Humacao soils are well drained and have medium runoff and moderate permeability.

USE AND VEGETATION: Major uses are for growing sugar cane and pasture. Native vegetation consists of grasses

and brush.

DISTRIBUTION AND EXTENT: Humid plutonic areas of Puerto Rico. The series is of small extent with about 1,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

National Cooperative Soil Survey
U.S.A.

LOCATION HUMATAS PR

Established Series
Rev. GRB
06/2002

HUMATAS SERIES

The Humatas series consists of very deep, moderately slowly permeable, well drained soils on side slopes and ridges of strongly dissected uplands. They formed in clayey and loamy material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 78 inches and the mean annual temperature is about 75 degrees F. Slopes range from 5 to 60 percent.

TAXONOMIC CLASS: Very-fine, parasesquic, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Humatas clay - native pasture. (Colors are for moist conditions.)

Ap-- 0 to 4 inches; dark brown (7.5YR 4/4) clay; moderate fine granular structure; firm, slightly sticky, slightly plastic; many fine roots; very strongly acid; clear smooth boundary. (4 to 8 inches thick)

Bt1--4 to 9 inches; yellowish red (5YR 5/6) clay; moderate fine subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, plastic; many fine roots; few fine vesicular and tubular pores; few fine black particles; very strongly acid; clear smooth boundary.

Bt2--9 to 15 inches; red (2.5YR 5/8) clay; moderate fine and medium subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, plastic; common fine roots; few fine vesicular and tubular pores, very strongly acid; clear smooth boundary.

Bt3--15 to 25 inches; red (2.5YR 5/6) clay; weak fine subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, slightly plastic; few fine roots; common fine vesicular and tubular pores; very strongly acid; clear smooth boundary. (Total thickness of the Bt horizons ranges from 12 to 31 inches)

BC--25 to 32 inches; rubbed color red (2.5YR 5/6) silty clay loam; about 30 percent of this horizon consists of saprolite

of variegated colors as: red (2.5YR 4/6), dark red (2.5YR 3/6), very pale brown (10YR 7/4), yellowish brown (10YR 5/8); weak fine and medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; many fine vesicular and tubular pores; very strongly acid; clear smooth boundary. (6 to 12 inches thick)

C1--32 to 45 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6); silty clay loam; massive; friable, nonsticky, slightly plastic; many fine pores; very strongly acid; clear smooth boundary.

C2--45 to 60 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6); saprolite that has a silty clay loam texture; massive; friable, nonsticky and slightly plastic; very strongly acid.

C3--60 to 96 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6) saprolite that has a clay loam texture; massive; very friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately 6.5 miles northeast of the city of Mayaguez; about 660 feet on dirt road from kilometer marker 2.45 on Highway 406, and about 350 feet southwest of dirt road.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 22 to 51 inches. Reaction is very strongly acid or strongly acid. Rock fragments range from 0 to 20 percent, by volume throughout, except for the A horizon which can range to 40 percent by volume.

The A horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. Texture is silty clay loam, silty clay, clay, or their gravelly analogs.

The Bt horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay, clay, or their gravelly analogs.

The BC horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8; or there is no dominant matrix color and are multicolored in shades of red, yellow, brown and gray. Texture is silty clay loam, silty clay, clay, or their gravelly analogs.

The C horizons has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay loam, clay loam, clay, or their gravelly analogs.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Humatas soils are on side slopes and ridges of uplands. They formed in fine-textured residuum weathered from basic igneous rock. The climate is humid tropical. Slopes range from 5 to 60 percent. The average annual precipitation ranges from 70 to 86 inches and the average annual temperature ranges from 74 to 76 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Alonso, Consumo, Daguey, Lares, Los Guineos, and Zarzal soils. Alonso soils have oxidic control sections. Consumo soils are moderately deep to saprolite. Daguey soils have more clay in the control section and are Oxisols. The somewhat poorly drained Lares soils are on terraces at lower elevations. Los Guineos soils are on higher positions, are isothermic, have more clay in the control section, and are Oxisols. Zarzal soils have more clay in the control section and are Oxisols.

DRAINAGE AND PERMEABILITY: Well drained; moderately slowly permeability.

USE AND VEGETATION: Most areas of Humatas soils are used for pasture, food crops, and coffee production. Vegetation consists of native and introduced upland species.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Survey Area, Puerto Rico; 1968.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon).

Argillic horizon - zone from 4 to 25 inches (Bt horizons).

ADDITIONAL DATA: Characterization data are available for the typical pedon S61PR-8-1 and pedon S61PR-8-4, both are published in Soil Survey Investigation Report No. 12. Samples by NSSL, Lincoln, NE.

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION INGENIO PR

Established Series
Rev. BCD
06/2002

INGENIO SERIES

The Ingenio series consists of very deep, well drained, moderately permeable soils formed in residuum from granitic rock on side slopes and narrow ridge tops of uplands. Slopes range from 5 to 40 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Hapludults

TYPICAL PEDON: Ingenio silty clay loam - pasture. (Colors are for the moist soil.)

Ap--0 to 7 inches; yellowish brown (10YR 5/4) silty clay loam, with many medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common fine quartz grains; few fine black grains; very strongly acid; clear smooth boundary. (5 to 10 inches thick)

Bt1--7 to 15 inches; red (2.5YR 5/6) silty clay; moderate medium and coarse prismatic structure with thin continuous yellowish red (5YR 4/8) coatings on vertical ped surfaces and common distinct coatings on horizontal ped surfaces; friable, slightly sticky, plastic; common fine roots; few fine pores; common fine quartz grains; few fine black grains; few krotovinas about 5 millimeters in diameter; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bt2--15 to 31 inches; red (2.5YR 4/6) clay, moderate medium and coarse subangular blocky structure with thin continuous reddish brown (2.5YR 5/4) coatings on vertical ped surfaces and common distinct coatings on horizontal ped surfaces; friable, slightly sticky, slightly plastic; common fine roots; few fine pores; common fine quartz grains; few fine black grains; few krotovinas 2 to 5 millimeters in diameter; strongly acid; gradual smooth boundary. (10 to 16 inches thick)

Bt3--31 to 40 inches; red (2.5YR 4/6) silty clay; weak medium and coarse subangular blocky structure with common distinct reddish brown (2.5YR 5/4) coatings on ped surfaces; friable, slightly sticky, slightly plastic; common fine roots;

common fine pores; common fine quartz grains; few fine black grains; few krotovinas one inch in diameter and thick clay coatings; very strongly acid; clear smooth boundary. (6 to 12 inches thick)

C1--40 to 51 inches; variegated colors; dusky red, yellow and white, crushed color dark yellowish brown (10YR 4/4); silty clay loam; massive; very friable, nonsticky, nonplastic; common fine roots; few fine pores; common fine quartz grains; very strongly acid; gradual smooth boundary. 50 percent of the horizon is saprolite. (8 to 12 inches thick)

C2--51 to 76 inches; saprolite with variegated colors; dusky red, yellow, yellowish brown and white; silt loam; massive; very friable, nonsticky, nonplastic; few dead roots with clay and organic coatings in root channels; many fine weathered feldspar grains; very strongly acid; diffuse smooth boundary. (20 to 30 inches thick)

C3--76 to 110 inches; saprolite of variegated colors; dusky red, yellow, yellowish brown and white, silt loam; massive; very friable, nonsticky, nonplastic; many fine feldspar grains; very strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 4.9 kilometers southwest of Humacao, 1.0 kilometer southwest from Surillo School, Tejas ward; Photo GS-LR-13-105.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 27 to 48 inches. Thickness of the argillic horizon varies from 22 to 38 inches. Quartz grains range from common to many in the whole profile. Reaction is strongly or very strongly acid in the whole profile. Cation exchange capacity (by NH4OAC) in the argillic horizon varies from 7.8 to 9.3 meq/100 grams of clay. Organic content in the upper 6 inches of the argillic horizon varies from 0.6 to 0.8 percent. Base saturation (by sum of cations) ranges from 19 to 25 percent. The mean annual soil temperature ranges from 76 to 78 degrees F.

The A horizon has hues of 10YR to 5YR, values of 3 to 5, and chroma of 3 or 4. High chroma mottles may or may not be present. Texture is clay loam or silty clay loam. Structure is weak fine or medium subangular blocky to moderate fine and medium granular.

The Bt horizons have hues of 2.5YR or 5YR, values of 4 or 5, and chroma of 4 to 8. Texture is clay or silty clay in the upper part and silty clay or silty clay loam in the lower part. Structure is weak or moderate fine to coarse subangular blocky. Consistence is slightly sticky and plastic throughout. Clay films range from very few to many.

The BC horizon, where present, is silty clay or silty clay loam.

The C horizons are mostly saprolite with variegated colors. Texture is silty clay loam, silt loam or loam.

COMPETING SERIES: There are no other known series in the same family. The Aibonito, Alonso, Consejo, Consumo, Corozal, Corozo, Daguey, Lirios, Jagueyes, Magens, Maricao, Moca, Patillas and Rio Piedias series are similar soils in related families. The Aibonito, Alonso and Daguey soils have higher organic matter content in the upper argillic horizon. The Consejo, Consumo, Corozal, Lirios, Maricao, Moca, Patillas and Rio Piedias soils all have higher CEC, more than 24 meq/100 grams of clay in the argillic horizon. The Corozo soils have sandy surface layers. The Jagueyes soils have coarser textured profiles dominantly sandy clay loam. The Magens soils have ustic moisture regimes.

GEOGRAPHIC SETTING: The Ingenio soils are moderately steep to steep soils on side slopes and narrow ridge tops with slope gradients of 5 to 40 percent. The regolith consists of medium and fine textured, highly weathered residuum of plutonic ingneous rocks, mainly granodiorite and quartz diorite. The climate is humid tropical. The average annual precipitation ranges from 75 to 85 inches and the mean annual temperature ranges from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Lirios and Jagueyes series and the Limones, Pandura, Pellejas, and Tejas series. The Lirios soils occupy steeper slopes, are shallower to the saprolite and have thinner argillic horizons. The Jagueyes soils occupy similar positions but have coarser textured profiles. The Limones soils occupy similar positions but have upper argillic horizons higher in organic matter. The Padura, Pellejas, and Tejas soils are shallower to the granitic rocks.

DRAINAGE AND PERMEABILITY: Well drained, medium to rapid runoff, moderate permeability.

USE AND VEGETATION: Native grasses and shrubs. Used for pasture and for minor crops.

DISTRIBUTION AND EXTENT: Humid granitic uplands of Puerto Rico. The series is of small extent, with about 4,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Este SCD, Puerto Rico; 1969.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Orthoxic Tropudults to Clayey, mixed, isohyperthermic Typic Hapludults. The previous OSED date was 7/85.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 7 inches (Ap horizon)

Argillic horizon - zone from 7 to 40 inches (Bt horizons)

ADDITIONAL DATA: Laboratory data are available for typical pedon S63PR-12-6

National Cooperative Soil Survey
U.S.A.

LOCATION JACANA PR

Established Series
Rev. BCD
01/2001

JACANA SERIES

The Jacana series consists of moderately deep, well drained, moderately slowly permeable soils formed in material weathered from volcanic rock. These gently sloping to moderately steep soils are on fans, foot slopes and low hills. Slopes range from 2 to 20 percent. The mean annual precipitation is about 35 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Vertic Haplustolls

TYPICAL PEDON: Jacana clay--cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 6 inches; very dark brown (10YR 2/2) clay; moderate fine granular structure; hard, friable, slightly sticky, plastic; common fine roots; medium acid; clear smooth boundary. (4 to 8 inches thick)

A--6 to 13 inches; very dark brown (10YR 2/2) clay; weak coarse subangular blocky structure; hard, firm, slightly sticky, plastic; few fine roots; few pressure faces and small slickensides; medium acid; clear wavy boundary. (3 to 9 inches thick)

Bss--13 to 21 inches; dark brown (7.5YR 3/2) clay; streaks of very dark brown (10YR 2/2) from overlying horizon; weak coarse blocky structure; hard, firm, slightly sticky, plastic; few fine roots; many small pressure faces and slickensides; cracks to 21 inches; neutral; clear wavy boundary. (6 to 10 inches thick)

C/B--21 to 28 inches; 80 percent saprolite from volcanic rock and 20 percent by volume dark brown (7.5YR 3/2) clay in pockets and seams; clay loam; massive; friable slightly sticky, slightly plastic; neutral; gradual wavy boundary. (6 to 10 inches thick)

Cr--29 to 40 inches; highly weathered, semi-consolidated bedded, volcanic rock.

TYPE LOCATION: Lajas Valley, Puerto Rico; 60 feet east of kilometer marker 1.7 of Highway 117, and 35 feet south of fence along highway.

RANGE IN CHARACTERISTICS: Depth to semiconsolidated rock ranges from 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline.

The A horizons have hue of 10YR or 7.5YR, and value and chroma of 2 or 3. Texture is clay loam or clay.

The Bss horizon has hue of 10YR or 7.5YR and value and chroma of 2 through 4.

The Cr horizon consists of highly weathered, semi-consolidated bedded volcanic rock. In places, secondary lime occurs as coatings along cleavage planes.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: The Jacana soils are on fans foot slopes and low hills. Slope is 2 to 20 percent. These soils formed in material weathered from volcanic rock. The climate is tropical semiarid. The mean annual precipitation is 30 to 40 inches and mean annual temperature is 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: There are the Callabo, Coamo, Descalabrado, Fraternidad, Juana Diaz, Llanos, and San German soils. Callabo soils do not have vertic properties. Coamo soils have an argillic horizon and do not have bedrock within a depth of 40 inches. Descalabrado, Juana Diaz, and San German soils have bedrock at depths less than 20 inches. Fraternidad and Llanos soils do not have bedrock within a depth of 40 inches.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderately slow permeability.

USE AND VEGETATION: Most areas are used for pasture. The main pasture species are Guineagrass and buffelgrass. Some areas are used for crops including tomatoes, peppers, pigeon peas, and mangos.

DISTRIBUTION AND EXTENT: Semiarid areas of Puerto Rico and the U.S. Virgin Islands. The soils of this series are of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1936.

REMARKS: The classification was updated with the 4/91 draft from Fine, mixed, isohyperthermic Udertic Haplustolls to Fine, mixed, isohyperthermic Vertic Haplustolls. It is presently impossible to have a Udic-ustic soil moisture regime in the tropics. The previous OSED date was 11/84.

Prior to 1984 this soil was classified as a fine, mixed, isohyperthermic Vertic Ustropept.

Diagnostic horizons and features recognized in this soil:

Mollic epipedon - zone from 0 to 13 inches (Ap and A horizons)

Vertic properties - pressure faces and slickensides in A and Bss horizons.

ADDITIONAL DATA: Sampled as S61PR-14-4.

National Cooperative Soil Survey
U.S.A.

LOCATION JAGUEYES PR

Established Series
Rev. BCD
07/2001

JAGUEYES SERIES

The Jagueyes series consists of very deep, moderately well drained, moderately permeable soils on side slopes and ridge tops of uplands. They formed in residuum of plutonic igneous rocks. Slopes range from 20 to 40 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine-loamy, kaolinitic, isohyperthermic Typic Kanhapludults

TYPICAL PEDON: Jagueyes sandy loam - cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark grayish brown (2.5Y 4/2) sandy loam; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common fine roots; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

A--8 to 14 inches; yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common fine roots; few medium black concretions; common fine shiny grains; many fine quartz grains; very strongly acid; clear smooth boundary. (4 to 8 inches thick)

Bt1--14 to 18 inches; yellowish brown (10YR 5/8) sandy clay loam with strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) coatings on surfaces of peds; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few faint clay films, few medium black concretions; common fine black grains; many fine quartz grains; very strongly acid; clear smooth boundary. (3 to 6 inches thick)

Bt2--18 to 26 inches; yellow (10YR 7/6) clay loam with many fine distinct dark red (2.5YR 3/6) and many medium distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; many prominent clay films; few medium black concretions; few fine black grains; many fine quartz grains; many weathered feldspar grains; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bt3--26 to 37 inches; yellow (10YR 7/6) and red (2.5YR 4/8) clay loam with few fine faint brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure; firm, nonsticky, slightly plastic; few fine roots; common distinct clay films; many fine quartz grains; few black grains; many weathered feldspar grains; very strongly acid; gradual smooth boundary. (8 to 14 inches thick)

Bt4--37 to 53 inches; red (2.5YR 4/8) sandy clay loam with brownish yellow (10YR 6/8) coatings; weak medium subangular blocky structure; friable; nonsticky, nonplastic; few fine roots, few faint clay films; many fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)

C1--52 to 71 inches; red (2.5YR 4/8) loam; massive; friable, nonsticky, slightly plastic; few fine black grains; many fine quartz grains; many fine weathered feldspar grains; very strongly acid; gradual wavy boundary. Fifty percent of this horizon consists of saprolite. (16 to 24 inches thick)

C2--71 to 95 inches; saprolite; red (2.5YR 5/8) loam; massive; friable, nonsticky, slightly plastic; very strongly acid; gradual smooth boundary. (18 to 28 inches thick)

C3--95 to 120 inches; saprolite red (2.5YR 5/6) sandy loam; massive; friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico, 7.5 kilometers southwest from Humacao; 7/7 kilometers north from Yabucoa; 1480 feet west from road junction at Mr. Ines Santiago's farm, Tejas Ward, Yabucoa. Seven hundred feet south of house and one hundred fifty feet NE of mango tree. Photo GS-LR-13-1103.

RANGE IN CHARACTERISTICS: Thickness of solum ranges from 39 to 60 inches. The soil ranges from strongly to extremely acid.

The A horizons have hues of 2.5Y or 10YR, values of 4 or 5, chromas of 2 through 6. The Ap horizon is sandy loam or loam.

The Bt horizons have dominant hues of 10YR or 7.5YR, values of 4 through 8 and chromas of 4 through 8. Mottles are common or many are red or dark red in color. Texture is sandy clay loam or clay loam. The structure ranges from weak to moderate subangular block. Clay films range from few faint to many prominent.

The C horizons have dominant red colors. They are sandy loam, loam, or sandy clay loam.

COMPETING SERIES: These are Aibonito, Alonso, Cialitos, Consumo, Corozal, Daguey, Ingenio, Limones, Lirios, Magens, Maricao, Moca, Rio Piedras, and Sabana Seca series. The Albonito, Cialitos, Daguey, and Limones soils have a higher content of organic matter in the argillic horizon. The Alonso and Ingenio soils have finer textured argillic horizons with more than 35 percent clay. The Consumo, Corozal, Lirios, Maricao, Moca, and Rio Piedras soils have higher cation exchange capacity--more than 24 meq/100 grams of clay - in their argillic horizons. The Magens soils are dry for more than 60 consecutive days during most years. The Sabana Seca soils are saturated with water during some part of the year and have dominant low chroma colors.

GEOGRAPHIC SETTING: The Jagueyes soils occur in sloping to steep sideslopes and narrow ridgetops. Slope gradients range from 20 to 40 percent. The soil formed in highly weathered residuum of plutonic igneous rocks, mainly quartz diorite and granodiorite. The climate is humid tropical. The average annual rainfall is from 75 to 85 inches and the mean annual temperature is from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ingenio and Lirios soils in addition to the Limones soils. The Limones soils occupy similar positions, but have argillic horizons with higher organic matter content.

DRAINAGE AND PERMEABILITY: Moderately well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Native pasture and shrubs. Used as pasture or planted to subsistence crops.

DISTRIBUTION AND EXTENT: Humid plutonic uplands. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Humacao, Puerto Rico; l972

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Orthoxic Tropudults to Fine-loamy, mixed, isohyperthermic Typic Hapludults. The previous OSED date was 7/73. The Jagueyes soils were included in the Jayuya series in the Soil Survey of Puerto Rico, l942.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 14 inches (Ap and A horizons)

Argillic horizon - zone from 14 to 53 inches (Bt horizons)

ADDITIONAL DATA: S63PR-12-10 Lincoln Laboratory data 19020-19028.

National Cooperative Soil Survey
U.S.A.

LOCATION JUNQUITOS PR

Established Series
Rev. WEM:RAB
06/2002

JUNQUITOS SERIES

The Junquitos series is moderately well drained, slowly permeable soils on foot slopes and fans. Typically, these soils have dark brown or brown, strongly acid, gravelly clay loam A horizons; yellowish brown, slightly acid, fine textured B horizons with weak subangular structure; and fine textured neutral C horizons underlain by angular volcanic rock fragments.

TAXONOMIC CLASS: Very-fine, mixed, active, isohyperthermic Aquic Hapludalfs

TYPICAL PEDON: Junquitos gravelly clay loam.
(Colors for moist conditions unless otherwise stated.)

Ap--0 to 7 inches; brown to dark brown (10YR 4/3) gravelly clay loam; massive; slightly hard, firm; nonsticky, slightly plastic; many medium and coarse angular and subrounded rock fragments; many fine roots; extremely acid; clear smooth boundary. (4 to 10 inches thick)

B1--7 to 21 inches; yellowish brown (10YR 5/8) clay with few fine distinct red (2.5YR 5/8) mottles; weak medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine subrounded rock fragments; few fine dark concretions; few fine roots; strongly acid; clear smooth boundary. (10 to 18 inches thick)

B2--21 to 28 inches; yellowish brown (10YR 5/8) clay with few fine distinct red (2.5YR 5/8) and few fine distinct light gray (10YR 7/1) mottles; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine patchy clay films; many fine and medium dark concretions; common fine and medium angular and subrounded rock fragments; slightly acid; clear boundary. (6 to 16 inches thick)

C1--28 to 35 inches; brownish yellow (10YR 6/8) clay with many coarse prominent red (2.5YR 5/8) and common medium distinct gray (10YR 5/1) mottles; massive; hard, firm, slightly sticky, slightly plastic; many fine dark concretions;

common fine subrounded rock fragments; neutral; abrupt smooth boundary. (6 to 12 inches thick)

IIR--35 inches plus--angular volcanic rock sediments.

TYPE LOCATION: Humacao, Puerto Rico; 0.6 miles north, 0.15 miles west and 15 meters south of kilometer marker 81.3 on Highway 3.

RANGE IN CHARACTERISTICS: Few to many fine to medium volcanic rock fragments are mixed throughout the soil. Soil reaction ranges from very strongly through extremely acid in the surface horizon. Dark concretions range from few to many in number and in size from fine to medium.

Gravelly clay loam, clay loam, and silty clay loam are the principal types with gravelly clay loam being dominant. Color of the Ap horizon ranges from brown (10YR 5/3) through very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4).

The B and C horizons are of 10YR or 2.5Y hue with values of 5 or 6, and with chromas of 4 through 8. Few, common, or many red (2.5YR 5/8) and few or common greenish gray (5GY 6/1) mottles may occur within 20 inches of the surface. Structure of the B horizons has a range in size of fine and medium. Thin patchy clay films may be few or common.

COMPETING SERIES: These include the Gurabo, Humacao, Juncos, and Vives series. The Gurabo soils are deeper, less acid, fine textured Vertisols with gravelly underlying materials. The Humacao soils are deeper, coarser textured and have thinner, less well expressed B horizons. The Juncos soils have darker colored A horizons and have thinner B horizons which are less acid and lack low chroma mottles. The Vives soils have finer textured, neutral A horizons; thicker, redder, neutral B horizons; thicker calcareous C horizons; and lack low chroma mottles.

GEOGRAPHIC SETTING: The Junquitos soils occur on gently to moderately sloping foot slopes and fans with gradients of 2 to 12 percent. The regolith consists of moderately fine or fine textured sediments derived from volcanic rock underlain by coarse angular volcanic rock fragments. The climate is humid tropical. The average annual precipitation ranges from 80 to 90 inches and the average annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Sabana, Naranjito, Fortuna, Via, Rio Arriba, and Mabi series. The Sabana soils are shallow with thin, weakly expressed B horizons, developed in residuum from Volcanic rocks. The Fortuna soils are finer textured, have gleyed cambic horizons, and occur on the lower more poorly drained

positions in the landscape. The Naranjito soils occur on the steeply dissected mountain slopes, are yellower in color, and have argillic horizons. The Via soils are deeper, coarser textured and have thicker B horizons free of low chroma mottles. The Rio Arriba soils have redder, more distinct B horizons and also have fine textured, mottled, buried B horizons underlying the solum. The Mabi soils are deep, fine textured Vertisols.

DRAINAGE AND PERMEABILITY: Moderately well drained with medium runoff and moderate or slow permeability.

USE AND VEGETATION: Cultivated areas used for the production of sugar cane, noncultivated areas are in native grasses and shrubs and used as pasture.

DISTRIBUTION AND EXTENT: In the humid mountainous sections of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Este Soil Conservation District, Puerto Rico; 1969.

REMARKS: The Junquitos series comprises the moderately deep soils having thicker B horizons that were mapped in the Sabana, Via, and Rio Arriba series in the earlier survey.

National Cooperative Soil Survey
U. S. A.

LOCATION LIMONES PR

Established Series
Rev. BCD
07/2001

LIMONES SERIES

The Limones series consists of very deep, moderately well drained, moderately permeable soils on side slopes and ridge tops of uplands. They formed in residuum from plutonic rocks. Slopes range from 20 to 60 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Kandiudox

TYPICAL PEDON: Limones clay - pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 5 inches; dark yellowish brown (10YR 4/4) clay with few fine distinct strong brown (7.5YR 5/8) and olive gray (5Y 5/2) mottles; weak fine and medium subangular blocky structure; friable, nonsticky, plastic; common fine roots; red coatings along root channels; few fine quartz grains; very strongly acid; clear smooth boundary. (4 to 6 inches thick)

Bo1--5 to 9 inches; dark yellowish brown (10YR 4/4) clay with few fine faint strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; friable, nonsticky, plastic; common fine roots; few faint clay films; few fine quartz grains; few fine black grains; very strongly acid; clear smooth boundary. (4 to 10 inches thick)

Bo2--9 to 16 inches; yellowish brown (10YR 5/6) clay with many medium distinct red (2.5YR 4/8) mottles; moderate medium and coarse subangular blocky structure; firm, slightly sticky, plastic; common fine roots; many distinct yellowish brown clay films on surfaces of peds and root channels; common fine quartz grains; few fine black concretions; very strongly acid; clear smooth boundary. (5 to 9 inches thick)

Bo3--16 to 26 inches; yellowish red (5YR 5/6) clay; moderate medium and coarse subangular blocky structure; firm, slightly sticky, plastic; common fine roots; many distinct strong brown clay films on surfaces of peds, root and worm channels; common fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. (8 to 12 inches thick)

Bo4--26 to 40 inches; yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, plastic; few fine roots; few faint strong brown clay films on surfaces of peds and root channels; few fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. Horizon consists of about 20 percent saprolite. (12 to 16 inches thick)

C1--40 to 54 inches; red (2.5YR 4/8) clay loam; massive; friable, nonsticky, plastic; few fine roots; thin clay films along root channels; many weathered feldspar grains; many fine quartz grains; very strongly acid; gradual smooth boundary. Horizon consists of saprolite. (10 to 16 inches thick)

C2--54 to 120 inches; variegated colors of the saprolite, red (2.5YR 4/8) rubbed color; silty clay loam; massive; friable, nonsticky, plastic; few fine roots, many fine quartz grains; common fine soft black grains; many weathered feldspar grains; very strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 3 kilometers west of the town of Yabucoa, 100 feet north of kilometer marker 14.2 Highway 182, Aerial photo GS-LR-9-25.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 33 to 53 inches. The soil ranges from strongly through extremely acid. Organic matter content is 1.5 percent or more in the upper 6 inches of the argillic horizon.

The A horizon has colors in hues of 10YR or 7.5YR, values of 4 and chromas of 2 to 4. It is dominantly clay or silty clay loam.

The upper part of the Bo horizon has dominant colors in hues of 10YR, 7.5YR, or 5YR, values of 4 to 6 and chromas of 4 to 8. The lower part of the Bo horizon includes hue of 2.5YR. Texture is dominantly clay and the structure ranges from moderate medium to coarse subangular blocky. Clay films range from few faint to many prominent.

The C horizon consists of very highly weathered saprolite with variegated colors, friable and with common to many sand sized quartz grains.

COMPETING SERIES: These are the Aceitunas, Aibonito, Alonso, Cialitos, Daguao, Daguey, Humatas, Ingenio, Jagueyes, Lares, Los Guineos, Magens, Naranjito, Sabana Seca, and Torres series. The Aceitunas and Torres soils have thicker argillic horizons. The Aibonito and Daguey soils have mixed mineralogy. The Alonso, Ingenio, and Jagueyes soils have lower organic matter values in the upper argillic horizon--less than 1.5 percent. In addition, the Alonso and Ingenio

soils have redder colors in the Bt horizon and the Jaguey lacks the dark brown upper B horizon and is sandier. The Cialitos soils have oxidic mineralogy. The Daguao, Humatas, Los Guineos, and Naranjito soils have higher exchange capacity values in the argillic horizon--more than 24 meq/100 grams of clay. The Lares soils have low chroma mottles within 30 inches of the surface. The Magens soils are dry for more than 90 cumulative days and occur in areas with less than 40 inches of annual rainfall. The Sabana Seca soils are saturated with water some time of the year and have dominant low chroma colors.

GEOGRAPHIC SETTING: The Limones soils occur in strongly to moderately steep sideslopes and narrow ridgetops with slope gradients ranging from 20 to 60 percent. The soil formed in fine textured residuum of very highly weathered plutonic rocks. The climate is humid tropical. Average rainfall varies from 75 to 85 inches. The mean annual temperature is from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Los Guineos series in addition to the Ingenio, Jagueyes, Pandura, and Patillas series, all of which occupy similar land forms. The Ingenio soils have lower organic matter content in the argillic horizon. The Jagueyes soils have coarser textured profiles, with less than 35 percent clay. The Lirios soils have thinner argillic horizons. The Los Guineos soils occur at higher elevations above sea level and have lower soil temperatures. The Pandura and Patillas soils are underlaid by less weathered plutonic rocks.

DRAINAGE AND PERMEABILITY: Moderately well drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: Native grasses and brush. Used for minor crops and for pasture.

DISTRIBUTION AND EXTENT: Humid plutonic uplands. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Humacao Survey ARea, Puerto Rico; l972.

REMARKS: This classification was updated with the 4/91 draft from Clayey, kaolinitic, isohyperthermic Epiaquic Orthoxic Tropohumults to Very-fine, kaolinitic, isohyperthermic Humic Hapludox. The previous OSED was dated 7/73.

The Limones soils were included in the Jayuya series in the Soil Survey of Puerto Rico, l942.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 5 inches (Ap horizon)

Oxic horizon - zone from 5 to 40 inches (Bo horizons)

ADDITIONAL DATA: S63PR-12-2 Lincoln Laboratory data 19047-19055.

National Cooperative Soil Survey
U.S.A.

LOCATION LIRIOS PR

Established Series
Rev. BCD
08/2000

LIRIOS SERIES

The Lirios series consists of very deep, well drained, moderately permeable soils formed in materials weathered from Plutonic age. They are steep to very steep soils on side slopes and ridgetops of strongly dissected uplands. Slopes range from 3 to 60 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Fine, mixed, subactive, isohyperthermic Typic Hapludults

TYPICAL PEDON: Lirios silty clay loam - cultivated. (Colors are for moist soil.)

Ap--0 to 4 inches; dark brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; many fine roots; many fine quartz crystals; common fine dark concretions; very strongly acid; abrupt smooth boundary. (4 to 8 inches thick)

Bt1--4 to 14 inches; red (2.5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; few faint clay films on surfaces of peds and root channels; common fine quartz crystals; few fine white flakes; very strongly acid; gradual smooth boundary. (8 to 12 inches thick)

Bt2--14 to 23 inches; red (10R 4/6) silty clay with common fine distinct reddish yellow (5YR 6/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few faint clay films on surfaces of peds; common fine quartz crystals; many fine shiny white flakes; very strongly acid; gradual smooth boundary. (8 to 14 inches thick)

C--23 to 60 inches; variegated colors; red (10R 4/6), strong brown (7.5YR 5/8), reddish brown (5Y 4/3), pink (5YR 7/3); silty clay loam; massive; friable, nonsticky, slightly plastic; many fine quartz crystals; many fine shiny flakes; very strongly acid. This horizon consists of saprolite.

TYPE LOCATION: Este SCD, Puerto Rico, Barrio Guayabota, Municipality of Yabucoa; 150 feet south of kilometer marker 11.9 on Highway 181. Photo GS-LR 9-25.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 34 inches. Thickness of the argillic horizon varies from 16 to 26 inches. They are strongly or very strongly acid throughout. Quartz crystals vary from none to many. Base saturation by sum of cation ranges from 10 to 18 percent. Organic carbon content in the upper 6 inches of the argillic horizon varies from 0.6 to 0.9 percent. The mean annual soil temperature ranges from 76 to 78 degrees F.

The A horizon has hue of 5YR to 10YR, value of 4 and chroma of 3 or 4. Texture is silty clay loam or clay loam and is nonsticky and slightly plastic.

The Bt horizon has hue of 5YR to 10R, value of 4 or 5, and chroma of 6 and higher. It is clay or silty clay and consistence is slightly sticky and slightly plastic, clay films vary from few faint to many prominent.

The BC horizon, where present, has hue of 2.5YR or 10R with reddish yellow, yellowish brown or brownish yellow mottles.

The C horizons are silty clay loam, loam, or silt loam.

COMPETING SERIES: There are no other known series in the same family. The Consumo, Consojo, Corozal, Corozo, Ingenio, Jagueyes, Maricao, Moca, Patillas and Rio Piedras series are similar soils in related families. The Consumo, Maricao and Patillas soils have argillic horizons thinner than 16 inches. The Consejo soils are yellower and finer textured throughout. The Corozal soils are wetter and have low chroma mottles in the upper B horizons. The Corozo soils have sandy surface layers. The Ingenio and Jagueyes soils have lower CEC values, less than 24 meq/100 grams of clay.

GEOGRAPHIC SETTING: The Lirios soils are gently sloping to very steep soils on side slopes and narrow ridgetops. Slope ranges from 3 to 60 percent. The soil formed in fine over mucky-fine textured, very highly weathered residuum weathered from plutonic rocks, mainly granodiorite or quartz diorite. The climate is humid tropical. The average annual precipitation ranges from 70 to 90 inches and the mean annual temperature ranges from 76 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ingenio soils in addition to the Pandura and Pellejas soils. The Pandura soils occur in similar positions but are shallow to less weathered plutonic rock. The Pellejas soils are thinner, coarser textured and lack argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: Original vegetation consists of native grasses and shrubs. The soils are used for pasture and food crops.

DISTRIBUTION AND EXTENT: Plutonic uplands. The series is of minor extent, about 28,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Humacao Area, Puerto Rico; 1968.

REMARKS: The classification was updated with the 4/91 draft from Clayey over loamy, mixed, isohyperthermic Typic Tropudults to Clayey, mixed, isohyperthermic Typic Hapludults. The previous OSED date was 7/85.

The diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon)

Argillic horizon - zone from 4 to 23 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION LOS GUINEOS PR

Established Series
BCD-HRM. Rev. GRB
07/2001

LOS GUINEOS SERIES

The Los Guineos series consists of very deep, well drained soils on side slopes of mountains. They formed in residuum from sandstone material. The mean annual precipitation is about 120 inches and the mean annual temperature is about 68 degrees F. Slopes range from 5 to 60 percent.

TAXONOMIC CLASS: Very-fine, kaolinitic, isothermic Humic Hapludox

TYPICAL PEDON: Los Guineos clay - forest. (Colors are for moist conditions.)

A--0 to 1 inch; dark yellowish brown (10YR 4/4) clay; moderate medium granular structure parting to moderate fine granular; firm; sticky, plastic; common very fine roots, many fine roots; few fine discontinuous tubular pores; many faint organic coats on vertical and horizontal faces of peds; extremely acid; clear smooth boundary. (1 to 5 inches thick).

Bt1--1 to 3 inches; yellowish brown (10YR 5/4) clay; moderate fine subangular blocky structure; firm; very sticky, very plastic; very few coarse, common fine and medium roots throughout; common very fine discontinuous tubular pores; few faint clay films on vertical and horizontal faces of peds; few worm casts; extremely acid; clear smooth boundary.

Bt2--3 to 9 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure parting to moderate coarse subangular blocky; firm; very sticky, very plastic; common fine and medium roots; common fine and medium discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; extremely acid; clear smooth boundary.

Bt3--9 to 18 inches; brownish yellow (10YR 6/6) clay; moderate coarse subangular blocky structure; firm; very sticky, very plastic; common fine and medium roots; few fine discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; common fine distinct red (2.5YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bt4--18 to 31 inches; red (2.5YR 4/6) clay; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; very sticky, very plastic; few fine roots; few medium discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; many coarse distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; gradual smooth boundary. (Combined thickness of the Bt horizons range from 25 to 50 inches)

Bw1--31 to 43 inches; red (2.5YR 4/6) clay; weak coarse subangular blocky structure; firm; very sticky; very plastic; few fine roots; few medium discontinuous tubular pores; common distinct films on vertical faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; gradual smooth boundary.

Bw2--43 to 61 inches; strong brown (7.5YR 5/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few fine roots; few medium discontinuous tubular pores; common faint films on vertical faces of peds; many medium distinct yellowish red (5YR 4/6) and few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; clear smooth boundary.

Bw3--61 to 74 inches; strong brown (7.5YR 5/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few medium discontinuous tubular pores; common distinct coatings in root channels and/or pores; about 10 percent, by volume, saprolite; many medium distinct yellowish red (5YR 4/6) masses of iron accumulation; very strongly acid; gradual smooth boundary.

Bw4--74 to 93 inches; yellowish red (5YR 4/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few medium discontinuous tubular pores; about 10 percent, by volume, saprolite; very strongly acid. (Thickness of the Bw horizon is 50 to 80 inches).

TYPE LOCATION: Rio Grande Municipio, Noreste SWCD; Caribbean National Forest, Puerto Rico. Approximately 150 feet southwest of bridge on Road 911. El Yunque topographic quadrangle; lat. 18 degrees 18 minutes 47 seconds N.; long. 65 degrees 49 minutes 27 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness and depth to bedrock is more than 80 inches. Rock fragments range from 0 to 10 percent, by volume, throughout the profile. Reaction ranges from extremely acid to strongly acid throughout the profile. The lower depth of the Oxic horizon is above 50 inches. Stones and cobbles range from 0 to 15 percent on the surface.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is clay loam or clay.

The Bt horizon has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is clay loam or clay.

The Bo horizon, where present, has hue of 2.5YR to 10YR, value of 4 or 5 and chroma of 6 or 8. Texture is clay.

The Bw horizon has hue of 2.5YR to 7.5YR, value of 4 to 6 and chroma of 6 to 8. Texture is clay (using either 2.5 or 3 times the 15 bar water). Because of poor dispersion, the measured clay content ranges from 15 to 45 percent. Saprolite ranges from 0 to 20 percent, by volume, in the lower part.

COMPETING SERIES: There are no competing series in the same family.

GEOGRAPHIC SETTING: These soils are mountain sides or deeply dissected plateaus of uplands. They formed in residuum from sandstone material. The climate is humid tropical. Slopes range from 5 to 60 percent. The annual precipitation ranges from 100 to 140 inches and the average annual temperature ranges from 65 to 72 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Moteado, Yunque, and Zarzal soils. The poorly drained Moteado soils are deep to bedrock. The moderately well drained Yunque soils have less clay in the control section. The moderately well drained Zarzal soils have a kaolinitic control section.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Watershed protection, recreation, research, and wildlife habitat. Most of the areas are now forested.

DISTRIBUTION AND EXTENT: Upland areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1936.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 1 inch (A horizon).

Oxic horizon - zone from 1 to 31 inches (Bt horizons).

Cambic horizon - zone from 31 to 93 inches (Bw horizons).

LABORATORY DATA: Characterization data - Caribbean National Forest, Puerto Rico. Pedon No. 86P303 and Soil Survey No. S86PR-3-10. Sample by NSSL, Lincoln NE., February, 1986.

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION MABI PR

Established Series
Rev. LHR
07/2001

MABI SERIES

The Mabi series is a member of the fine, montmorillonitic, isohyperthermic family of Vertic Eutropepts. These soils have fine textured, sticky, plastic layers with pressure faces and slickensides that intersect.

TAXONOMIC CLASS: Very-fine, mixed, active, isohyperthermic Aquic Hapluderts

TYPICAL PEDON: Mabi clay - Guava orchard.
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) clay with few fine faint yellowish brown mottles and red (2.5YR 4/6) coatings along root channels; weak fine granular structure; hard, very firm, slightly sticky, plastic; common fine roots; common fine black nodules; few fine fragments of volcanic rock; very strongly acid; clear smooth boundary. (6 to 12 inches thick)

B1--7 to 15 inches; dark yellowish brown (10YR 4/4) clay with few fine distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces; very firm, slightly sticky, plastic; common fine roots; few fine black nodules; few fine fragments of volcanic rock; strongly acid; clear wavy boundary. (6 to 12 inches thick)

B2--15 to 24 inches; yellowish brown (10YR 5/6) clay with many medium distinct gray (10YR 5/1) mottles; brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces and slickensides that intersect; very firm; slightly sticky, plastic; few fine roots; few fine black nodules; few fine fragments of volcanic rock; coatings along root channels; medium acid; clear wavy boundary. (8 to 12 inches thick)

C1--24 to 38 inches; yellowish brown (10YR 5/4) clay with few fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium and coarse angular blocky structure with many pressure faces and

slickensides that intersect; very firm, slightly sticky, plastic; few fine black nodules; few fine fragments of volcanic rock; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary. (12 to 14 inches thick)

C2--38 to 53 inches; yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with common pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine fragments of volcanic rock; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary. (12 to 18 inches thick)

C3--53 to 67 inches; yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with few pressure faces and slickensides very firm, slightly sticky, plastic; few fine black nodules; few fine and medium fragments of volcanic rock; few fine carbonatic concretions; mildly alkaline; gradual wavy boundary. (10 to 18 inches thick)

C4--67 to 90 inches; auger sample-mixed yellowish brown (10YR 5/4) and greenish gray (5GY 6/1) clay; massive; very firm, slightly sticky, plastic; few fine black nodules; weak effervescence with dilute HCL; mildly alkaline. (15 to 30 inches thick)

C5--90 to 113 inches; auger sample-yellowish brown (10YR 5/6) clay with few medium distinct greenish gray (5GY 6/1) mottles; massive; very firm, slightly sticky, plastic; weak effervescence with dilute HCL; mildly alkaline.

TYPE LOCATION: Turabo SCD, Puerto Rico; 1.2 kilometers west of town of Gurabo. Eight hundred feet north and 600 feet west of Gurabo Experiment Station headquarters. Photo CS-LR 15-72.

RANGE IN CHARACTERISTICS: Depth to semiconsolidated volcanic rock is more than 5 feet. Distinct or prominent low chroma mottles occur within 20 inches of the surface. These soils have crack that open and close more than once during the year, but do not remain open for more than 90 cumulative days. There are years in which the soil may not crack. These soils are plastic throughout. The soil ranges from very strongly acid in the surface horizons through moderately alkaline in the lower C horizon.

The A horizon has a hue of 10YR, moist values of 3 or less, dry values of 5 or less, and chromas of 2 or more.

The B and C horizons have hues of 10YR or 2.5YR, values of 4 through 6, and chromas of 2 through 4.

COMPETING SERIES: These are the Camaguey, Cartegena, Fraternidad, Juncos, Montegrande, Mucara, Paso Seco, and Santa Isabel series. The Camaguey soils have chromas of less than 1.5 in the upper 12 inches. The Cartagena, Fraternidad, Paso Seco, and Santa Isabel soils all have cracks that open and close more than once during the year but remain open for more than 90 cumulative days during the year. The Juncos and Mucara soils are moderately deep to semiconsolidated volcanic rock. The Montegrande soils contain gravelly horizons within 40 inches of the surface.

GEOGRAPHIC SETTING: The Mabi soils occur in gently to moderately sloping alluvial fans and terraces above the river flood plains. The slope gradient ranges from 2 to 20 percent. The soil formed in fine textured sediments derived volcanic rocks. The climate is humid tropical. The average annual rainfall is 78 inches and the mean annual temperature is 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Gurabo, Juncos, Mucara, Montegrande, and Rio Arriba series. The Gurabo soils occupy similar positions in the landscape, but have gravelly horizons within 40 inches of the surface. The Rio Arriba soils have brighter colors and argillic horizons.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; medium to slow runoff; slow permeability.

USE AND VEGETATION: Sugar cane and pasture.

DISTRIBUTION AND EXTENT: Humid inner valleys of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The Mabi series was formerly classified in the Grumusols great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION MACHETE PR

Established Series
Rev. RAB:LHR
06/2002

MACHETE SERIES

The Machete series is a member of the fine, mixed, isohyperthermic family of Typic Haplustalfs. These soils have reddish brown, granular, strongly acid A horizons; yellowish red, fine textured, acid B horizons over coarser textured C horizons.

TAXONOMIC CLASS: Very-fine, mixed, active, isohyperthermic Aridic Paleustalfs

TYPICAL PEDON: Machete loam - sugar cane
(Colors are for moist soil.)

Ap--0 to 9 inches; reddish-brown (5YR 4/3) loam; weak fine granular structure; very friable; many fine roots; few fine black concretions; common fine sand grains; strongly acid; clear smooth boundary. (7 to 14 inches thick)

A12--9 to 14 inches; reddish-brown (5YR 4/3) loam; weak fine granular structure; very friable; few fine roots; common medium and fine pores; common fine sand grains; strongly acid; clear smooth boundary. (3 to 10 inches thick)

B1--14 to 20 inches; reddish-brown (5YR 4/4) clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common medium and fine pores; thin patchy clay films; few fine black concretions; many fine sand grains; strongly acid; clear smooth boundary. (4 to 12 inches thick)

B2t--20 to 32 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin discontinuous clay films, more numerous on vertical ped faces and in root channels than on horizontal ped faces; few worm casts; few black concretions; many sand grains; strongly acid; clear smooth boundary. (8 to 14 inches thick)

B3--32 to 39 inches; reddish-brown (5YR 4/4) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films on peds and in root channels; few black concretions; many sand

grains; few subrounded pebbles; strongly acid; abrupt smooth boundary. (5 to 12 inches thick)

IIC1--39 to 45 inches; reddish-brown (5YR 4/3) gravelly sandy clay loam; structureless, massive; friable; strongly acid; abrupt smooth boundary. (4 to 12 inches thick)

IIIC2--45 to 60 inches plus; dark brown (7.5YR 4/4) loamy sand; structureless, massive; very friable; strongly acid.

TYPE LOCATION: Arroyo, Puerto Rico; 1,000 feet east of Lafayette Sugar Central (Irrigation Reservoir) and 200 feet south of reservoir, 40 feet east of trail.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 27 to 62 inches. Soil reaction varies from very strongly to strongly acid. Mean annual soil temperature at 20 inches is 72 degrees F. or more and the difference between mean summer and mean winter temperatures is less than 9 degrees F. Mineralogy is mixed. Base saturation (by sum of cations) is 35 percent or more at 50 inches below the top of the argillic horizons. These soils are dry for 90 cumulative days or more during most years.

Colors of the surface horizons are in hues of 5YR and 7.5YR, values of 4 and chromas of 2 to 4. Texture of the surface layers ranges from sandy loam to clay loam.

Colors of the B horizons are in hues of 7.5YR and 5YR, values of 4 to 6 and chromas of 4 to 8. Structure of the B2t horizons range from weak to moderate subangular blocky. Dark concretions range from few to common and from fine to medium in size in the B horizons. The B3 horizons range from clay loam to sandy clay loam in texture.

C horizons are stratified gravelly sandy clay loams to loamy sands.

COMPETING SERIES: These are the Amelia, Bexar, Katemcy, Lindy, Guayama, Lavallee and Dorothea series. The Amelia soils have more than 35 percent coarse fragments in their argillic horizons. The Bexar, Katemcy and Lindy soils have thermic soil temperatures. The Guayama soils have hard rock within 20 inches of the surface. The Lavallee soils have coarser textured argillic horizons with less than 35 percent clay. The Dorothea soils have yellower B horizons in hues of 10YR and are less acid-neutral to medium acid.

GEOGRAPHIC SETTING: The Machete soils are on nearly level to gently sloping terraces and alluvial fans on the Coastal Plain. Slopes range from 0 to 5 percent. The regolith is moderately coarse to fine textured sediments derived from

volcanic rocks. The climate is semiarid. Rainfall ranges form 30 to 45 inches and the average mean annual temperature is 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are in the Fraternidad, San Anton and Vives series. The Fraternidad soils are finer textured, dark colored, and calcareous. The Vives soils have darker colored A horizons and are neutral to mildly alkaline in reaction. The San Anton soils formed in recent sediments on flood plains have finer texture in the A horizon and are neutral to mildly alkaline in reaction.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium. Permeability is moderate.

USE AND VEGETATION: Most of the soil is cultivated and used for growing sugar cane, under irrigation.

DISTRIBUTION AND EXTENT: Semiarid coastal plains of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

REMARKS: The Machete series was formerly classified in the Red-Yellow Podzolic great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION MAUNABO PR

Established Series
Rev. RAB:WEM
07/2001

MAUNABO SERIES

The Maunabo series is poorly drained, slowly permeable on flood plains. These soils have grayish brown strongly acid fine textured A horizons, fine textured strongly acid mottled B horizons and moderately coarse textured strongly acid mottled C horizons.

TAXONOMIC CLASS: Clayey over loamy, mixed, semiactive, acid, isohyperthermic Typic Endoaquepts

TYPICAL PEDON: Maunabo clay.
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 4 inches; light brownish gray (10YR 6/4) clay, few fine faint strong brown (7.5YR 5/6) mottles; structureless, massive; very firm, slightly sticky, plastic; common roots; few fine quartz grains; few fine black mineral grains; black charred sugarcane; strongly acid; gradual smooth boundary. (5 to 8 inches thick)

A12--4 to 10 inches; grayish brown (10YR 5/2) clay, common medium distinct strong brown (7.5YR 5/6) mottles; structureless, massive; very firm, slightly sticky, plastic; common roots; few fine pores; dark colored old roots; small charcoal fragments; few fine black mineral grains; strongly acid; gradual smooth boundary. (5 to 10 inches thick)

B1g--10 to 15 inches; gray (5Y 5/1) clay, common medium distinct yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very firm, slightly sticky, plastic; common fine roots; dark coatings along root channels; few fine quartz grains; few fine black mineral grains; strongly acid; gradual smooth boundary. (4 to 8 inches thick)

B2g--15 to 22 inches; gray (5Y 6/1) clay, common medium yellowish red (10YR 5/8) mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; dark coatings along root channels; fine roots; common fine pores; few fine quartz grains; strongly acid; gradual smooth boundary. (5 to 12 inches thick)

B3g--22 to 39 inches; greenish gray (5G 6/1) silty clay, many medium distinct strong brown (7.5YR 5/6) and dark red (2.5YR 3/6) mottles; structureless, massive; very firm, slightly sticky, plastic; few roots; common fine quartz grains; common fine dark mineral grains; strongly acid; gradual smooth boundary. (10 to 20 inches thick)

IICg--39 to 48 inches plus; greenish gray (5BG 5/1) sandy loam; structureless, massive; very friable; many silvery flakes; strongly acid.

TYPE LOCATION: Yabucoa, Puerto Rico; 1,562 feet northeast of the intersection of Highways 905 and 3.

RANGE IN CHARACTERISTICS: Depth to coarser textured sediments ranges from 36 to 50 inches. Soil reaction ranges from very strongly acid to strongly acid. The water table fluctuates from 20 to 40 inches.

The A horizon texture ranges from silty clay to clay. Color of the A horizon ranges from dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/4).

The B horizon ranges in texture from sandy clay to clay. Color of the B horizon ranges from gray (5Y 6/1) to greenish gray (5BG 5/1). It contains common to many, 20 to 30 percent of the mass, medium to coarse mottles, having chromas of 4 or more, and common to many dark bluish gray (5B 4/1) mottles. Structure of B horizons is dominantly weak medium to coarse subangular blocky. Thin discontinuous coatings are on vertical ped faces and along root channels. Horizontal cleavage planes are very weak and have small amounts of coatings.

COMPETING SERIES: These are in the Bajura, Candelero, Fortuna, Josefa, Talante, and Vayas soils. The Josefa soils have A and upper B horizons that are coarser textured and free of low chroma mottles, and the mottled horizon is deeper in the profile. The Talante soils are similar in drainage but are coarser textured. The Fortuna soils are similar in depth, color, texture and drainage but are less acid. The Candelero soils have coarser textured A horizons, stronger subsoil structure and contain many quartz and feldspar crystals throughout. The Bajura soils are similar in texture and drainage but are less acid and have dark colored surface horizons. The Vayas soils are similar in drainage and texture, but they are browner, and less mottled, and they are neutral to moderately alkaline in reaction.

GEOGRAPHIC SETTING: The Maunabo soils occur on the nearly level floodplains. Slopes are 0 to 1 percent. The regolith consists of fine textured sediments derived from granitic rock. The climate is humid tropical. The average annual precipitation is 87 inches, and average annual temperature about 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are in the competing Josefa and Talante series, and in the Reilly, Vivi and Yabucoa series. All these soils are on the nearly level flood plains, and they have formed in sediments derived mainly from granitic rock. The Yabucoa soils are moderately fine textured and moderately well drained. The Vivi soils are deep, well drained medium textured soils occupying the high well drained positions on the flood plains. The Reilly soils are shallow gravelly soils on levees along the streams.

DRAINAGE AND PERMEABILITY: Poorly drained. Runoff is slow. Permeability is slow.

USE AND VEGETATION: Most of the soil is cultivated and it is used for growing sugarcane.

DISTRIBUTION AND EXTENT: Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

REMARKS: The Maunabo series was formerly classified in the Low-Humic Gley great soil group.

National Cooperative Soil Survey
U. S. A.

LOCATION MAYO PR

Established Series
Rev. RAB:LHR
07/2001

MAYO SERIES

The Mayo series consists of acid soils that have very dark brown, sandy loam A horizons, dark brown, sandy loam B horizons and brown sandy loam C horizons.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, isohyperthermic Humic Dystrudepts

TYPICAL PEDON: Mayo sandy loam--cultivated sugarcane.
(Colors are for moist soil.)

Ap--0 to 8 inches; very dark brown (10YR 2/2) sandy loam; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; common fine roots; very strongly acid; clear smooth boundary. (6 to 13 inches thick)

B--8 to 18 inches; dark brown (10YR 3/3) sandy loam; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots; common fine quartz grains and black concretions; common fine weathered feldspar crystals; very strongly acid; clear smooth boundary. (8 to 13 inches thick)

C1--18 to 27 inches; brown (10YR 4/3) sandy loam: massive; soft, very friable, nonsticky, nonplastic; few fine roots; many fine quartz grains; common fine weathered feldspar crystals; few fine black concretions; very strongly acid; gradual smooth boundary. (8 to 13 inches thick)

IIC2--27 to 34 inches; pale brown (10YR 6/3) loamy sand; massive; loose; many fine quartz grains; few fine shiny flakes; many fine dark grains; very strongly acid; abrupt smooth boundary. (6 to 15 inches thick)

IIIC3--34 to 44 inches; pale brown (10YR 6/3) sandy loam; massive; loose; very friable; many fine quartz grains; few fine dark grains; common fine weathered feldspar crystals; very strongly acid; abrupt smooth boundary. (8 to 14 inches thick)

IIIC4--40 to 60+ inches; brown (10YR 5/3) sandy loam; massive; very friable, many fine quartz grains; common fine black grains; common fine weathered feldspar crystals; few fine shiny and flaky grains; strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 2.6 miles north of the town of Yabucoa; 1.2 miles northwest of intersection of Highways 905 and 3.

RANGE IN CHARACTERISTICS: Thickness of the solum is 14 to 26 inches. Reaction of all horizons is strongly or very strongly acid.

The A horizon is very dark grayish brown (10YR 3/2; 2.5Y 3/2), dark brown (10YR 3/3) or very dark brown (10YR 2/2). Texture is sandy loam or loam.

The B horizon is dark brown (10YR 3/3) or dark yellowish brown (10YR 3/4). Texture is sandy loam or loam. Structure is weak subangular blocky or granular.

The C horizon is very pale brown (10YR 7/3, 7/4), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), brown (10YR 5/3) or yellowish brown (10YR 5/4). Texture is sandy loam or loamy sand.

COMPETING SERIES: These are the Limani, Pandura, Vivi, and Yunes series. Limani soils have organic matter content that does not decrease regularly with depth and they have more than 18 percent clay in the 10- to 40-inch control section. Pandura soils are shallow to plutonic rocks. Vivi soils have base saturation of 50 percent or more in the A and B horizons and organic matter decreases erratically with depth. Yunes soils have more than 35 percent coarse fragments and are shallow to volcanic rocks.

GEOGRAPHIC SETTING: The Mayo soils occur on gently to moderately sloping alluvial fans and terraces. Slope gradients range from 2 to 12 percent. The regolith consists of coarse textured sediments derived from overlying plutonic rocks. The climate is humid tropical. The average annual precipitation is 75 to 85 inches and the mean annual air temperature is 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are Pandura and Vivi of the competing series and the Candelero, Coloso, Maunabo, Patillas, and Teja soils. The Candelero, Coloso, and Maunabo soils have colors of dominantly low chroma. The Patillas soils have argillic horizons and are shallow to saprolite from plutonic rock. Teja soils have hard plutonic rock at 10 to 20 inches beneath the soil surface.

DRAINAGE AND PERMEABILITY: Well to excessively drained. Runoff is medium. Permeability is rapid.

USE AND VEGETATION: Mayo soils are used for growing minor crops and sugarcane. Native vegetation consists of brush, weeds, and pasture.

DISTRIBUTION AND EXTENT: Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

REMARKS: The Mayo soils were classified in the Alluvial great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION MEROS PR

Established Series
Rev. LHR
6/71

MEROS SERIES

The Meros series have very dark grayish brown, sandy A horizons underlain by brownish sandy C horizons.

TAXONOMIC CLASS: Mixed, isohyperthermic Typic Ustipsamments

TYPICAL PEDON: Meros sand - pasture
(Colors are for moist soil unless otherwise stated.)

A11--0 to 8 inches; very dark grayish brown (10YR 3/2) fine sand; single grained; loose, nonsticky, nonplastic; many fine roots; common fine black minerals; neutral; clear smooth boundary. (6 to 10 inches thick)

A12--8 to 14 inches; very dark brown (10YR 2/2) fine sand; single grained; loose, nonsticky, nonplastic; few fine roots; many fine black minerals; neutral; clear smooth boundary. (6 to 10 inches thick)

C1--14 to 22 inches; very dark grayish brown (10YR 3/2) fine sand; single grained; loose, nonsticky, nonplastic; few fine roots; neutral; clear smooth boundary. (8 to 12 inches thick)

C2--22 to 40 inches; dark yellowish brown (10YR 4/4) and black (10YR 2/1) sand; single grained; loose, nonsticky, nonplastic; mildly alkaline; clear smooth boundary. (16 to 24 inches thick)

C3--40 to 50 inches; olive brown (2.5Y 4/4) sand; single grained; loose, nonsticky, nonplastic; mildly alkaline; clear smooth boundary. (8 to 16 inches thick)

C4--50 to 60 inches; very dark grayish brown (2.5Y 3/2) sand; single grained; loose, nonsticky, nonplastic; moderately alkaline.

TYPE LOCATION: Sudeste Soil and Water Conservation District, Puerto Rico; 150 feet north of kilometer marker 93.8 of Highway 1 and 20 feet east of Tamarindo tree.

RANGE IN CHARACTERISTICS: The soil texture in all horizons is sand or fine sand. The mean annual soil temperature ranges from 78 to 80 degrees F.

Color of the A horizon is black (N 2/), very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2; 2.5Y 3/2), or dark brown (10YR 3/3). It is neutral or mildly alkaline.

The C horizon is very dark grayish brown, through dark olive hues of 10YR, 2.5Y or 5Y, value of 3 or 4, and chromas of 2 through 4. It is neutral through moderately alkaline.

COMPETING SERIES AND THEIR DIFFERENCES: These are the Aguadilla and Arenales series in the same family and Catano, Espinal, Falfurrias, and Jaucas series. The Aguadilla, Catano, and Espinal soils have udic moisture regimes. The Arenales soils have well graded soil materials in the control section consisting of silts, coarse sand, and gravel. The Falfurrias soils have more than 9 degrees F., difference between mean summer and mean winter temperatures. The Jaucas soils have carbonatic mineralogy.

GEOGRAPHIC SETTING: The Meros soils occur on nearly level benches along the coast at elevations slightly above sea level. Slope gradients are 0 to 2 percent. The soil formed in sandy sediments derived from sand sized volcanic fragments, sea shells, and corals. The climate is semiarid tropical. The average yearly precipitation is 35 to 40 inches. The mean annual temperature is about 79degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Hydraquents and Coastal beach land types. Coastal beach is a land type that consists of miscellaneous sandy materials reworked by wave action. Hydraquents are the clayey soils of the tidal marches that are permanently saturated with water.

DRAINAGE AND PERMEABILITY: Excessively drained; slow runoff; very rapid permeability.

USE AND VEGETATION: Used mostly for pasture and coconuts.

DISTRIBUTION AND EXTENT: Semiarid coastal areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l936.

REMARKS: The Meros series was classified in the Regosol great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION MUCARA PR

Established Series
Rev. GRB
06/2002

MUCARA SERIES

The Mucara series consists of moderately deep, well drained soils on side slopes of strongly dissected uplands. They formed in material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 78 inches and the mean annual temperature is about 76 degrees F. Slopes range from 15 to 70 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Dystric Eutrudepts

TYPICAL PEDON: Mucara clay - pasture. (Colors are for moist soil)

Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) clay; weak medium granular structure; firm, slightly sticky, plastic; few fine black (10YR 2/1) concretions; many fine roots; moderately acid; clear smooth boundary. (4 to 8 inches thick)

Bw--6 to 12 inches; about 50 percent very dark grayish brown (10YR 3/2) and about 50 percent brown (10YR 5/3) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots along structural faces; few distinct pressure faces on surfaces of peds; slightly acid; abrupt irregular boundary. (6 to 12 inches thick)

C--12 to 22 inches; brown (10YR 4/3) loam; massive; friable; slightly sticky, slightly plastic; few fine roots; about 30 percent, by volume, saprolite; few distinct tongues of B material; neutral; gradual wavy boundary. (10 to 16 inches thick)

R--22+ inches; semi-consolidated igneous rock.

TYPE LOCATION: Suroeste SCD, Puerto Rico. Approximately 1.5 miles east of bridge of Highway 2 over the Rosario River and about 100 feet north of the highway.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 10 to 20 inches. Rock fragments range from 0 to

15 percent, by volume. Depth to semi-consolidated rock ranges from 20 to 40 inches. Reaction ranges from moderately acid to neutral in the A and Bw horizons and slightly acid or neutral in the C horizon.

The A horizon has hue of 5YR to 2.5Y, value of 2 to 5, and chroma of 2 to 4. Texture is silty clay loam, silty clay, or clay.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 6. Texture is clay loam, silty clay, or clay.

The BC horizon, where present, has colors and textures similar to the Bw horizon.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4; or there is no dominant color and is multicolored in shades of brown, yellow, and gray. Texture is loam or clay loam.

The R layer is semi-consolidated igneous rock.

COMPETING SERIES: There no competing series in the same family.

GEOGRAPHIC SETTING: Mucara soils are on side slopes of strongly dissected uplands. They formed in fine-textured residuum weathered from basic igneous rock. The climate is humid tropical. Slopes range from 15 to 70 percent. The average annual precipitation ranges from 75 to 80 inches and the average annual temperature ranges from 75 to 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Caguabo, Maraguez, Morado, and Quebrada series. These soils are on similar landscape positions. In addition, Caguabo soils are shallow to bedrock, Maraguez soils are very deep and have less clay in the subsoil, Morado soils have less clay in the subsoil, and Quebrada soils are very deep and have mixed mineralogy in the control section.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Many areas of Mucara soils are used for growing sugarcane, food crops, coffee, and pastureland. Some areas are in woodland. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of major extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - the zone from 0 to 6 inches (Ap horizon).

Cambic horizon - the zone from 6 to 12 inches (Bw horizon).

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION NARANJITO PR

Established Series
Rev. BCD
08/2000

NARANJITO SERIES

The Naranjito series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from volcanic rocks. They are moderately steep to very steep soils on sideslopes and ridgetops of dissected uplands. Slopes range from 12 to 60 percent. The mean annual precipitation is about 88 inches and the mean annual temperature is about 76 degrees F.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Naranjito silty clay loam - native pasture. (Colors are for moist soil.)

A--0 to 7 inches; dark brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; common fine roots; thin clay films on root channels; 5 percent 1/4 to 1 inch volcanic rock fragments; extremely acid; clear smooth boundary. (5 to 10 inches thick)

Bt1--7 to 20 inches; yellowish red (5YR 4/6) clay; weak fine subangular blocky structure; very hard, firm, slightly sticky, plastic; few fine roots; few faint dark brown (10YR 3/3) clay films; 10 percent angular 1/8 to 2 inch volcanic rock fragments; very strongly acid; gradual smooth boundary. (10 to 16 inches thick)

Bt2--20 to 30 inches; yellowish red (5YR 4/6), and yellowish brown (10YR 5/4) clay; weak fine subangular blocky structure; very hard, firm, slightly sticky, plastic; common distinct dark brown (10YR 3/3) clay films on faces of peds, along root channels and worm holes; 10 percent 1/8 to 2 inch angular volcanic rock fragments; 40 percent by volume is saprolite; very strongly acid; gradual smooth boundary. (4 to 15 inches thick)

C--30 to 38 inches; yellowish red (5YR 4/6), red (2.5YR 4/6) , and light olive brown (2.5Y 5/4) clay loam; massive; hard, firm, slightly sticky, plastic; common fine dark concretions; 15 percent 1/8 to 3 inch angular rock fragments; saprolite; very strongly acid; abrupt smooth boundary. (0 to 14 inches thick)

R--38 inches; semi-consolidated volcanic rock.

TYPE LOCATION: Barrio Jacaboa, Patillas, Puerto Rico; 150 feet southwest of kilometer marker 3.5, Highway 758.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 40 inches and depth to semi-consolidated rock ranges from 25 to 40 inches. Angular gravel fragments, 1/8 to 2 inches in size, range from 5 to 15 percent by volume throughout the soil. The soil ranges from strongly acid to extremely acid throughout. Mean annual soil temperature ranges from 76 to 80 degrees F.

The A horizons have hues of 7.5YR or 10YR, values of 4 or 5, and chroma of 3 or 4. They are silty clay loam.

The Bt horizons have hues or 5YR or 7.5YR, values of 4 to 6, and chroma of 4 to 8. They are clay and have weak or moderate, fine or medium subangular blocky structure. They have few faint or common distinct clay films.

The C horizon has variegated colors. It is clay loam or silty clay loam and has slightly plastic or plastic consistence.

COMPETING SERIES: The Daguao series is in the same family. Daguao soils have hue of 10YR in the B horizon and crystals of hornblende.

The Alonso, Aibonito, Ciales, Cidral, Daguey, Humatas, Lares, Limones, Lirios, Los Guineos, Picacho, Rio Piedras, and Voladora series are similar soils in related families. Alonso, Aibonito, Daguey and Limones soils have CEC values between 16 and 24 meg/100 grams of clay. The Ciales, Lares and Picacho soils have low chroma mottles in the B horizon. Cidral soils have sola thicker than 60 inches. Humatas and Rio Piedras soils have kaolinitic mineralogy. Lirios soils have clayey over loamy particle-size control sections. Los Guineos soils have hues of 10YR in the upper part of the B horizon. Voladora soils are Rhodudults.

GEOGRAPHIC SETTING: The Naranjito soils are moderately steep to very steep on sideslopes and ridgetops of strongly dissected volcanic uplands. Slopes range from 12 to 60 percent. The soils formed in moderately fine to fine textured residuum weathered from volcanic rocks. The climate is humid tropical. The average annual rainfall ranges from 75 to 100 inches, and the average annual temperature is from 74 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Daguey and Humatas series and the Consumo and Mucara soils, all of which are on similar volcanic sideslopes and ridgetops. The Consumo soils have thinner

argillic horizons. The Mucara soils lack argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid. Permeability is moderate.

USE AND VEGTATION: Most of the soil is in native grasses and shrubs. Small areas are used for growing subsistence crops and tame grasses.

DISTRIBUTION AND EXTENT: Humid volcanic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, (Soil Survey), 1942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Typic Tropohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED date was 5/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 7 inches (A horizon)

Argillic horizon - zone from 7 to 30 inches (Bt horizons)

Lithic feature - zone at 38 inches (R layer)

National Cooperative Soil Survey
U.S.A.

LOCATION PANDURA PR

Established Series
Rev. RAB-LHR
06/2002

PANDURA SERIES

The Pandura series consists of shallow, well drained soils formed in materials weathered from plutonic rocks. They are moderately steep to very steep soils on side slopes of dissected uplands. They have loam to sandy loam A and B horizons over weathered and partially weathered plutonic rocks.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, isohyperthermic, shallow Dystric Eutrudepts

TYPICAL PEDON: Pandura loam - pasture
(Colors are for moist soil.)

Ap--0 to 3 inches; dark brown (10YR 3/3) loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; many fine quartz grains; many worm casts; strongly acid; clear smooth boundary. (3 to 6 inches thick)

B2--3 to 7 inches; dark grayish brown (10YR 4/2) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic, many fine roots; few thin patchy clay films on surfaces of peds; many fine quartz grains; many worm casts; many fine dark colored weathered minerals; strongly acid; gradual smooth boundary. (3 to 5 inches thick)

B3--7 to 15 inches; light olive brown (2.5Y 5/4) sandy loam; massive; friable; nonsticky, nonplastic; few fine roots; many fine quartz grains; medium acid; gradual wavy boundary. (6 to 9 inches thick)

C1--15 to 19 inches; light olive brown (2.5Y 5/4) sandy loam; massive; friable; nonplastic; very few fine roots; slightly acid; gradual wavy boundary. (0 to 8 inches thick)

C2r--19 to 35 inches; partially weathered igneous rock of sandy loam texture; rock structure; friable; slightly acid.

TYPE LOCATION: Sudeste SCD, Puerto Rico; 150 feet northeast of kilometer marker 23.9 of Highway 181.

RANGE IN CHARACTERISTICS: Solum thickness and depth to the paralithic contact ranges from 12 to 20 inches. Mean annual soil temperature ranges from 76 to 80 degrees F. Base saturation below a depth of 10 inches is more than 80 percent. The soil has common or many fine quartz grains throughout.

The A horizons have hues of 7.5YR and 10YR, values of 3 and 4, and chroma of 3 and 4. They are loam or sandy loam.

The B horizons have hues of 7.5YR through 2.5Y and values and chromas of 3 to 6. They are loam or sandy loam and have weak medium or fine subangular blocky structure or subhorizons are massive.

The C horizons have hues of 10YR or 2.5Y, values of 5 through 7, and chroma of 3 through 6. They are loam or sandy loam.

COMPETING SERIES: There are no other known series in the same family. The Caguabo, Cuchillas, Dique, Juana Diaz, Juncos, Junquitos, Malaya, Mani, Maraguez, Maresua, Montegrande, Morado, Mucara, Plata, Quebrada, and Vivi series are similar soils in related families. Caguabo and Malaya soils have hard rock within a depth of 20 inches. Cuchillas soils have an isothermic temperature regime. Dique and Vivi soils have an irregular decrease in organic matter with depth. Juana Diaz soils have an ustic moisture regime. Juncos, Montegrande, and Mucara soils have higher COLE values and crack when dry. Junquitos and Mani soils have low chroma mottles. Maraguez, Morado, and Quebrada soils lack a paralithic contact within a depth of 20 inches. Maresua and Plata soils have more than 35 percent coarse fragments in the particle-size control section.

GEOGRAPHIC SETTING: The Pandura soils are sloping to steep and on side slopes of dissected uplands. Slope gradients range from 20 to 60 percent. The soils formed in loamy residuum from partially weathered plutonic rocks, mainly quartz diorite and granodiorite. The climate is humid tropical. The average yearly precipitation is 75 to 85 inches and the mean annual air temperature is 76 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Candelero, Cayagua, Ingenio, Jagueyes, Limones, Lirios, Mayo, Patillas and Teja series. The Candelero, Cayagua and Mayo soils occur in terraces and footslopes and have thicker profiles. The Ingenio, Jagueyes, Limones, Lirios, Patillas and Teja soils are in similar side slopes. The Ingenio, Jagueyes, Limones, Lirios and Patillas soils are more weathered and have redder profiles. The Teja soils have hard rock within 20 inches of the surface.
DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid. Permeability is moderately rapid.

USE AND VEGETATION: Principal use is for growing pasture of native grasses and tame. Small acreage is in food crops.

DISTRIBUTION AND EXTENT: Humid plutonic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

National Cooperative Soil Survey
U.S.A.

LOCATION PARCELAS PR

Established Series
Rev. RAB:LHR
06/2002

PARCELAS SERIES

The Parcelas series have dark brown, clay, A horizons, brown clay B horizons over yellowish brown, clay or clay loam C horizons.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Vertic Hapludalfs

TYPICAL PEDON: Parcelas clay - pasture.
(Colors are for moist soil.)

Ap--0-7 inches; Dark brown (7.5YR 3/2) clay; weak fine subangular blocky structure; firm, plastic, slightly sticky; many fine roots; extremely acid; clear wavy boundary. (5 to 10 inches thick)

B1--7-17 inches; Dark reddish brown (5YR 3/3) clay; weak medium subangular blocky structure; firm, plastic, sticky; common fine roots; extremely acid; clear smooth boundary. (7 to 12 inches thick)

B2--17-31 inches; Brown (7.5YR 4/4) clay; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm, plastic; sticky; few fine roots; few small slickensides and pressure surfaces; extremely acid; clear smooth boundary. (10 to 15 inches thick)

C1--31-44 inches; Yellowish brown (10YR 5/6) clay; massive; firm, plastic, slightly sticky; very few fine roots; few small slickensides and pressure surfaces; strongly acid; clear smooth boundary. (10 to 14 inches thick)

C2--44-60 inches plus; Yellowish brown brown (10YR 5/8) clay loam; massive; friable, plastic, slightly sticky; strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico; Barrio Nuevo, municipality of Yabucoa; 1000 feet south of kilometer

marker 3.6 of Highway 901 and 250 feet north of mango tree.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 22 to 37 inches. Reaction is strongly through extremely acid in all horizons.

The A horizon is dark brown (7.5YR 3/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2). The texture is clay.

The B horizon is dark reddish brown (5YR 3/2, 3/4), reddish brown (5YR 4/4, 5/4), yellowish red (5YR 4/6, 5/8), dark brown (7.5YR 4/4), brown (10YR 4/3, 5/3), strong brown (7.5YR 5/6, 5/8), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4, 5/8). The texture is clay. Structure ranges from weak medium to coarse subangular blocky. Slickensides and pressure surfaces range from few to common.

The C horizon has similar colors of the B horizons and also includes light yellowish brown (10YR 6/4), brownish yellow (10YR 6/6, 6/8), light brown (7.5YR 6/4), reddish yellow (5YR 6/6, 6/8); (7.5YR 6/6, 6/8), or light reddish brown (5YR 6/4). The texture is clay or clay loam. Slickensides vary from few to common in the upper, clayey C horizons but seldom intersect.

COMPETING SERIES: These are the Bajura, Gurabo, Juncos, Moca, Montegrande, Mucara, Rio Arriba, and Santoni soils. The Bajura and Santoni soils have dominant chromas to 2 or less throughout the soil. The Gurabo, Juncos, Montegrande, and Mucara soils have base saturation of more than 50 percent in the A and B horizons. Juncos and Mucara soils also have montmorillonitic mineralogy. Moca and Rio Arriba soils have Bt horizons.

GEOGRAPHIC SETTING: The Parcelas soils occur on strongly sloping footslopes, alluvial fans and terraces. Slope gradients are 5 to 12 percent. The regolith is fine textured sediments which have been derived from soils weathered from plutonic rock. The climate is humid tropical. Mean annual rainfall is 80 to 90 inches. The mean annual temperature is 76 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Candelero, Cayagua, Mayo, Pandura, Patillas, and Teja soils. The Candelero and Cayagua soils have dominant colors with chromas of 2 or less. The Majo soils have less than 18 percent clay in the control section. Pandura, Patillas, and Teja soils occur on steep sideslopes and are less than 20 inches to plutonic rock.

DRAINAGE AND PERMEABILITY: Moderately well drained. Runoff is medium. Permeability is moderately slow.

USE AND VEGETATION: Used mostly for growing sugarcane. Some areas are in grass and used as pasture. Original vegetation was native brush and grasses.

DISTRIBUTION AND EXTENT: Humid plutonic areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Este SCD, Puerto Rico; 1969

REMARKS: This soil was formerly included in the Pandura series. The Parcelas soils would have been classified in the Red-Yellow Podzolic great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION PASO SECO PR

Established Series
Rev. REG-RLV
08/2000

PASO SECO SERIES

The Paso Seco series consists of very deep, moderately well drained, slowly permeable soils on alluvial fans. They formed in fine textured sediments overlying gravelly, medium textured sediments. These soils have gilgai surface relief where not cultivated. Slopes range from 0 to 5 percent. The mean annual precipitation is about 35 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Entic Udic Haplusterts

TYPICAL PEDON: Paso Seco clay - native pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) clay; moderate medium and coarse subangular blocky structure; hard, slightly sticky, plastic, many fine roots; few fine pores; common cracks 2 to 3 centimeters wide; many pressure faces; common fine rounded and subrounded rock fragments; few pockets of dark brown clay between cracks; neutral; clear wavy boundary. (5 to 10 inches thick)

ABss1--6 to 19 inches; dark yellowish brown (10YR 3/4) clay; intersecting slickensides-with numerous parallelepipeds; firm, sticky, plastic; common fine roots; few fine pores; common cracks 2 to 3 centimeters wide; few fine concretions; common fine rounded and subrounded rock fragments; streaks of very dark brown from above; neutral; gradual wavy boundary. (5 to 15 inches thick)

ABss2--19 to 28 inches; dark yellowish brown (10YR 3/4) clay; intersecting slickensides; sticky, plastic; few fine roots, common fine pores; common cracks 1 to 2 centimeters wide; common rounded and subrounded rock fragments; few dark concretions; mildly alkaline; clear smooth boundary. (5 to 12 inches thick)

BC--28 to 32 inches; dark brown (7.5YR 4/4) gravelly clay; massive; firm, slightly sticky, slightly plastic; many gravel fragments 1/8 to 1 inch in diameter; mildly alkaline; clear smooth boundary. (4 to 15 inches thick)

2C--32 to 40 inches; dark brown (7.5YR 4/4) very gravelly loam; massive; very friable, nonsticky, nonplastic; many rounded rock fragments 1/8 to 3 inches in diameter; mildly alkaline.

TYPE LOCATION: Sudeste SCD, Salinas, Puerto Rico; 0.15 mile north from kilometer marker 148.6 of Highway 3, 35 feet west of farm road.

RANGE IN CHARACTERISTICS: Depth to the discontinuity ranges from 28 to 35 inches. The soil is usually moist, but when dry it has cracks ranging from 0.5 to 3 inches in width extending to the very gravelly 2C horizons. Cracks are open from 90 to 150 days (cumulative) during most years. The soil is clayey throughout the A, ABss and BC horizons. The typifying pedon is from a microlow. Cycles of microlows and microhighs are repeated each 7 to 15 feet. The thickness of the A and ABss horizons varies from 30 inches in the microlow to 15 inches in the microhigh. Reaction throughout the A, ABss and BC horizons ranges from neutral in the microlows through mildly alkaline in the microhighs. Intersecting slickensides are common in the A ABss horizon.

The A and ABss horizons have hue of 10YR, value of 3, and chroma 2 through 4. Texture is clay.

The BC horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 4. It ranges from clay to gravelly clay.

The 2C horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 4. Texture is very gravelly loam or very gravelly clay loam with 35 to 60 percent by volume of gravel.

COMPETING SERIES: These are the Aguirre, Cartagena, Fe, Fraternidad, Guanica, and Poncena series in similar subgroups. Aguirre, Guanica, and Poncena soils are less well drained and have A horizons with colors of lower chroma. In addition, Poncena soils have a calcic horizon. The Cartagena, Fe, and Fraternidad soils lack horizons with more than 35 percent gravel within 40 inches of the soil surface.

GEOGRAPHIC SETTING: The Paso Seco soils occur on nearly level to gently sloping alluvial fans. Slope gradients range from 0 to 5 percent. The soil formed in fine textured sediments of mixed origin which overlie gravelly medium textured sediments. The climate is semiarid tropical. Average yearly rainfall is 30 to 40 inches and mean annual air temperature is 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the competing Cartagena and Fraternidad soils, these are the Jacana soils. Jacana soils are on higher positions with rock within 40 inches.

DRAINAGE AND PERMEABILITY: Moderately well drained; slow runoff; slow permeability.

USE AND VEGETATION: Where irrigated, most acreage is used for growing sugarcane. Areas not irrigated are in native grasses and used as pasture.

DISTRIBUTION AND EXTENT: Coastal Plains of southern Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1936

REMARKS: The classification was previously updated with the 4/91 draft from Clayey over loamy-skeletal, mixed, isohyperthermic Udic Chromusterts to Fine, mixed, isohyperthermic Entic Chromusterts. The previous OSED was dated 6/71.

Diagnostic horizons and features recognized in this pedon:

Slickensides and vertic features - zone from 6 to 28 inches (ABss and BC horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION PATILLAS PR

Established Series
Rev. BCD
06/2002

PATILLAS SERIES

The Patillas series consists of very deep, well drained, moderately permeable soils on dissected uplands. They formed in residuum of intrusive plutonic rocks. Slopes range from 20 to 60 percent. The mean annual precipitation is about 65 inches and the mean annual temperatue is about 79 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic, shallow Typic Hapludults

TYPICAL PEDON: Patillas clay loam - pasture. (Colors are for moist soil.)

A--0 to 8 inches; dark brown (10YR 3/3) clay loam; weak fine subangular blocky separating to moderate medium granular structure; friable, slightly plastic, nonsticky; common fine roots; few fine pores; few fine black minerals; few fine quartz crystals; common fine rock fragments; strongly acid; clear smooth boundary. (7 to 10 inches thick)

Bt--8 to 19 inches; reddish brown (5YR 4/4) clay loam; weak fine subangular blocky structure; friable, slightly plastic, slightly sticky, few fine roots; common fine pores; few faint clay films on ped surfaces; few fine quartz crystals; common fine rock fragments; few weathered feldspar fragments; strongly acid; clear wavy boundary. (10 to 14 inches thick)

C--19 to 48 inches plus; yellowish red (5YR 4/6) saprolite that crushes to sandy loam; massive; friable, nonplastic, nonsticky; coatings of finer textured materials from overlying horizon on fracture planes; very strongly acid.

TYPE LOCATION: Sudeste SCD, Puerto Rico; 1.8 kilometers east from kilometer marker 162.2 of Highway No. 3 and 1.25 kilometers southeast from Highway 757, in the vicinity of the town of Patillas, Puerto Rico.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 15 to 24 inches. Most pedons have few or common quartz crystals, and fine rock fragments in the solum. Reaction is strongly or very strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 and chroma of 3 or 4. Texture is silty clay loam or clay loam.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5 and chroma of 4 to 8. Texture is silty clay loam or clay loam. Structure is weak fine through coarse subangular blocky. Clay films range from few faint to many prominent.

The C horizon has hue of 7.5YR or 5YR, value of 4 to 6 and chroma of 4 to 8. Texture ranges from sandy loam through loamy sand.

COMPETING SERIES: These are the Alonso, Consumo, Corozal, Ingenio, Jagueyes, Lirios, Maricao, Moca, Pandura, and Rio Piedras soils. The Alonoso, Consumo, Corozal, Ingenio, Lirios, Maricao, Moca, and Rio Piedras soils have more than 35 percent clay in the control section, and with the exception of Maricao and Consumo, have Bt horizons more than 16 inches thick. The Jagueyes soils have CEC less than 24 meq/100 grams of clay and Bt horizons more than 16 inches thick. The Pandura soils lack Bt horizons.

GEOGRAPHIC SETTING: The Patillas soils occur on moderately steep through very steep sideslopes of dissected uplands with slope gradients of 20 to 60 percent. The regolith is weathered residuum of intrusive plutonic rocks, mainly quartz diorite and grandiorite. The climate is humid tropical. The mean annual rainfall is 60 to 70 inches, and the mean annual temperature is 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the competing Pandura soils, these include the Limones and Parlcelas soils. The Limones soils are more clayey and have kaolinite mineralogy. The Parcelas soils are more clayey, have slickensides, and lack Bt horizons.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium. Permeability is moderate.

USE AND VEGETATION: Most of the acreage is used for the production of tobacco and subsistence crops. A smaller acreage is in native grasses and used as pasture.

DISTRIBUTION AND EXTENT: Humid plutonic uplands of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Sudeste SCD, Puerto Rico; 1969.

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Dystropeptic Tropudults to Fine-loamy, mixed, isohyperthermic Typic Hapludults. The previous OSED date was 8/69.

This soil was formerly included in the Pandura series. The Patillas soils would have been classified in the Lithosol great soil group.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 8 inches (A horizon)

Argillic horizon - zone from 8 to 19 inches (Bt horizon)

National Cooperative Soil Survey
U.S.A.

LOCATION PINONES PR

Established Series
Rev. RAB:LHR
06/2002

PINONES SERIES

The Pinones series consists of soils with very dark grayish brown, silty clay A horizons, dark gray, mottled silty clay, B horizons over acid, dark reddish brown muck at depths of about 18 inches.

TAXONOMIC CLASS: Fine, mixed, superactive, acid, isohyperthermic Fluvaquentic Endoaquepts

TYPICAL PEDON: Pinones silty clay - sugarcane.
(Colors are for moist soil.)

Ap--0-4 inches; Very dark grayish brown (10YR 3/2) silty clay; common medium distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable, slightly sticky, plastic, many fine roots; very strongly acid; clear smooth boundary. (7 to 12 inches thick)

B21g--4-13 inches; Dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm, slightly sticky, plastic, common fine roots; very strongly acid; clear smooth boundary. (7 to 12 inches thick)

B22g--13-18 inches; Dark gray (10YR 4/1) silty clay; many coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure firm, slightly sticky, plastic; few fine roots; very strongly acid; clear smooth boundary. (4 to 8 inches thick)

11C--18-58 inches plus; Dark reddish brown (5YR 3/2) muck: well decomposed; very strongly acid.
TYPE LOCATION: Este SCD, Humacao, Puerto Rico; 1 mile northeast of Central Pasto Viego, 100 feet west of main farm road on unimproved secondary road and 30 feet north of unimproved road.

RANGE IN CHARACTERISTICS: The A horizon is very dark grayish brown (10YR 3/2; 2.5Y 3/2), very dark gray

(10YR 3/1; N 3/), very dark brown (10YR 2/2) or black (10YR 2/1; N 2/). Texture is silty clay or silty clay loam.

The B horizon is gray (10YR 5/1; 4/7, N 5/; 5Y 5/1; 6/1) or dark gray (10YR 4/1; N 4/ ; 5Y 4/1) with common to many mottles in shades of yellow and brown.

COMPETING SERIES: These are the Bajura, Coloso, Corcega, Fortuna, Igualdad, Maunabo, Perchas, Reparada, Santoni, and Vayas series. These soils except Reparada, lack buried organic layers within 40 inches of the surface. Bajura and Santoni soils have coefficient of linear extensibility of 0.09 or more, and they have pressure faces and slickensides. Coloso soils have slightly to medium acid reactions. Corcega soils have sandy clay loam or silty clay loam B horizons over sandy C horizons. Reparada and Vayas soils have neutral to moderately alkaline reactions.
GEOGRAPHIC SETTING: The Pinones soils occur on nearly level coastal lowlands with slope gradients from 0 to 2 percent. The regolith consists of fine textured sediments of mixed origin which overlie decomposed and partially decomposed organic layers. The climate is humid tropical. The average yearly rainfall is 80 to 90 inches and the mean annual air temperature is 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Coloso, Fortuna, and Maunabo series.

DRAINAGE AND PERMEABILITY: Poorly drained; runoff is slow; permeability is very slow.

USE AND VEGETATION: Natural vegetation consists of hydrophytic plants, such as, Para grass, and Camandulas. These soils are used for growing sugarcane when drained.

DISTRIBUTION AND EXTENT: Coastal areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942

National Cooperative Soil Survey
U.S.A.

LOCATION PONCENA PR

Established Series
Rev. JLL/GRB
08/1999

PONCENA SERIES

The Poncena series consists of very deep, moderately well drained, slowly permeable soils on terraces and alluvial fans. They formed in material that weathered from volcanic rocks and limestone. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 40 inches. Slopes range from 0 to 12 percent.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Typic Calciusterts

TYPICAL PEDON: Poncena clay - pasture. (Colors are for moist conditions)

Ap--0 to 11 inches; black (N 2/0) clay; moderate medium granular structure; hard, firm, sticky, plastic; many fine roots; few fine volcanic rock fragments; neutral; gradual wavy boundary. (8 to 14 inches thick)

ABss--11 to 18 inches; mixed black (N 2/0) and very dark grayish brown (10YR 3/2) clay; massive when wet, weak medium subangular blocky structure when dry; firm; sticky, plastic; few fine roots; common distinct slickensides having polished and grooved surfaces; few fine volcanic rock fragments; neutral; gradual wavy boundary. (5 to 8 inches thick)

Bss--18 to 30 inches; dark brown (10YR 3/3) clay; weak coarse subangular blocky structure; firm; sticky, plastic; few fine roots; many distinct intersecting slickensides having polished and grooved surfaces; few fine volcanic rock fragments; neutral; clear irregular boundary. (8 to 12 inches thick.)

Bkss--30 to 38 inches; grayish brown (2.5Y 5/2) clay; weak coarse subangular blocky structure; firm; sticky, plastic; few distinct slickensides having polished and grooved surfaces; few fine weathered volcanic rock fragments; many medium and coarse distinct white (10YR 8/2) soft masses of secondary calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary. (6 to 20 inches thick)

C--38 to 60 inches; about 50 percent dark brown (10YR 4/3) weathered volcanic rock and about 50 percent white (N 8/0) calcareous earth; clay loam; massive; friable; few black (10YR 2/1) pebbles; strongly effervescent; moderately alkaline.

TYPE LOCATION: Cabo Rojo Municipality, Puerto Rico. Approximately 0.6 mile east of the intersection of P.R. 101 and P.R. Hwy. 103, about 222 feet south of P.R. Hwy. 101 in pasture. Puerto Real topographic quadrangle; lat. 18 degrees 01 minute 47 seconds N.; long. 67 degrees 07 minutes 48 seconds W. PRD 1940.

RANGE IN CHARACTERISTICS: Depth to the weathered volcanic rock is 30 to 50 inches. Depth to the Bkss horizon is 21 to 34 inches. Reaction is neutral to moderately alkaline in throughout.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or less; or it is neutral with value of 2 or 3. Texture is clay loam or clay.

The Bss horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4.

The Bkss horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 4.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4 for the weathered volcanic rock. The calcareous material has hue of 7.5YR or 10YR, value of 7 or 8, and chroma of 2 or less; or it is neutral with value of 7 or 8.

COMPETING SERIES: There are no competing series in the same family.

GEOGRAPHIC SETTING: Poncena soils are on terraces and alluvial fans. They formed in material that weathered from volcanic rocks and limestone. The climate is tropical semiarid. Slopes range from 0 to 12 percent. The average annual temperature ranges from 78 to 80 degrees F., and the average annual precipitation ranges from 35 to 50 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Aguirre, Cartagena, Descalabrado, Guanica, Fraternidad and Jacana soils. None of these soils have a calcic horizon. Aguirre, Cartagena, and Guanica soils are somewhat poorly drained. Descalabrado soils have hard rock at shallow depths. Fraternidad soils have browner colors. Jacana soils have a paralithic contact at moderate depths.

DRAINAGE AND PERMEABILITY: Moderately well drained; slow permeability.

USE AND VEGETATION: Poncena soils are used for sugarcane and for pasture. The main pasture species are guineagrass, stargrass, pangolagrass, and buffelgrass.

DISTRIBUTION AND EXTENT: Semiarid areas of Puerto Rico. The soils are of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Mollic epipedon - zone from 0 to 30 inches (Ap, ABss and Bss horizons).

Slickensides and vertic features - zone from 18 to 38 inches (Bss and Bkss horizons).

Calcic horizon - zone from 30 to 38 inches (Bkss horizon).

MLRA: 271, 273.

National Cooperative Soil Survey
U.S.A.

LOCATION POZO BLANCO PR

Established Series
Rev. LRR/GRB
7/98

POZO BLANCO SERIES

The Pozo Blanco series consists of very deep, well drained, moderately slowly permeable soils on uplands of the Semiarid Coastal Plains MLRA. They formed in clayey and loamy marine sediments. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 30 inches. Slopes range from 0 to 20 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Aridic Calciustolls

TYPICAL PEDON: Pozo Blanco clay - in pastureland. (Colors are for moist soils unless otherwise indicated.)

Ap--0 to 8 inches; dark brown (7.5YR 3/3) clay; dark brown (10YR 3/3) dry; strong medium granular structure; firm, slightly sticky, plastic; many very fine, fine, and medium roots; many very fine interstitial pores; about 5 percent, by volume, pebbles; moderately alkaline; slightly effervescent (HCl, 1N); clear wavy boundary.

Bw--8 to 12 inches; very dark grayish brown (10YR 3/2) clay, dark brown (10YR 3/3) dry; strong medium angular blocky structure; firm; slightly sticky, moderately plastic; many very fine and fine roots; few medium roots; many very fine and few fine tubular and vesicular pores; about 5 percent, by volume, pebbles; moderately alkaline; moderately effervescent (HCl, 1N); clear wavy boundary.

Bk1--12 to 26 inches; dark yellowish brown (10YR 4/4) clay, dark brown (10YR 4/3) dry; moderate medium subangular blocky structure; firm; slightly sticky, moderately plastic; many very fine roots, few fine roots; many very fine, few fine tubular and vesicular pores; few filaments of calcium carbonate; about 10 percent, by volume, pebbles; moderately alkaline; moderately effervescent (HCl, 1N); abrupt wavy boundary.

Bk2--26 to 45 inches; yellowish brown (10YR 5/4) gravelly loam, brown (10YR 5/3) dry; many distinct very pale brown (10YR 7/3) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; many very fine

roots, common fine roots; many very fine and common fine tubular and vesicular pores; many prominent soft masses of calcium carbonate; about 15 percent, by volume, pebbles; strongly alkaline; strongly effervescent (HCl, 1N); clear wavy boundary.

C--45 to 59 inches; dark brown (10YR 4/3) very gravelly loam, brown (10YR 5/3) dry; many distinct very pale brown (10YR 7/3) mottles; massive; friable; slightly sticky, nonplastic; many very fine roots, common fine roots; many very fine, few fine tubular and vesicular pores; common prominent soft masses of calcium carbonate; about 45 percent, by volume, pebbles; about 10 percent, by volume, cobbles; strongly alkaline; strongly effervescent (HCl, 1N); clear wavy boundary.

2C--59 to 76 inches; very pale brown (10YR 7/3) silt, white (10YR 8/2) dry; many distinct very dark grayish brown (10YR 3/2) mottles; massive; friable; slightly sticky, nonplastic; few very fine roots; many very fine, common fine tubular and vesicular pores; many prominent soft masses of calcium carbonate; about 10 percent, by volume, pebbles; strongly alkaline; strongly effervescent (HCl, 1N); abrupt wavy boundary.

3C--76 to 96 inches; very dark grayish brown (10YR 3/2) clay loam, very dark gray (10YR 3/1) dry; many distinct very pale brown (10YR 7/3) mottles; massive; friable; slightly sticky, slightly plastic; few fine and medium roots; few very fine tubular and vesicular pores; common prominent soft masses of calcium carbonate; about 5 percent, by volume, pebbles; moderately alkaline; strongly effervescent (HCl, 1N).

TYPE LOCATION: Lajas Municipio, Puerto Rico. Approximately 2.9 miles southwest of La Parguera and about 2.2 miles southeast of Rancho Cabassa and about 100 feet east of dirt road; USGS Parguera topographic quadrangle; lat. 17 degrees 57 minutes 58 seconds N. and long. 67 degrees 5 minutes 30 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 20 to 60 inches. Reaction is slightly alkaline or moderately alkaline in the A, Ap, and Bw horizons, and moderately alkaline or strongly alkaline in the Bk and C horizons.

The A or Ap horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Texture is loam, clay loam, clay, or their gravelly analogs.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. Texture is clay loam, clay, or their gravelly analogs. Content of pebbles ranges from 0 to 25 percent, by volume.

The Bk horizon has hue of 10YR, value of 4 to 6, and chroma of 4 or 6. Texture is loam, clay loam, clay, or their gravelly analogs. Filaments and soft masses of calcium carbonate range from common to many. Content of pebbles ranges from 5 to 25 percent, by volume.

The C horizon has hue of 10YR to 5Y, value of 3 to 7, and chroma of 2 to 6. Texture ranges from silt to clay loam or their gravelly analogs. Content of pebbles and cobbles ranges from 0 to 60 percent, by volume.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: Pozo Blanco soils are on uplands of the Semiarid Coastal Plains MLRA. They formed in clayey and loamy marine sediments. Slopes range from 0 to 20 percent. The climate is tropical semiarid. The average annual temperature ranges from 78 to 80 degrees F., and the average annual rainfall ranges from 30 to 40 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Aguilita, Duey, Jacana, Montalva, Parguera, and San German soils. All of these soils except Parguera soils are on higher positions. In addition, Aguilita soils are deep to soft limestone bedrock and have coarse-loamy, carbonatic control sections. Duey soils are shallow to soft limestone bedrock. Jacana soils are moderately deep to saprolite of igneous origin. Parguera soils are on similar positions, but have clayey control sections. San German soils are shallow to soft limestone bedrock, have clayey-skeletal control sections, and lack a Mollic epipedon.

DRAINAGE AND PERMEABILITY: Well drained; moderately slowly permeability.

USE AND VEGETATION: Most areas of Pozo Blanco soil are in pastureland. A few areas are in wildlife refuges. Vegetation consists of Yerba huracan, Baboraton, Mesquite, and other xerophytic grasses and shrubs.

DISTRIBUTION AND EXTENT: In the semiarid coastal plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico; 1936.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - zone from 0 to 12 inches.

Calcic horizon - zone from 12 to 45 inches.

Cambic horizon - 20 to 31 inches.

The type location was moved to its present location in 1998 and the series reclassified based on soil lab data and observations in the field.

ADDITIONAL DATA: Characterization pedon - Lajas Municipio, Puerto Rico; S97PR-079-001. Sample by the NSSL, Lincoln, NE., 6/97.

MLRA: 273.

National Cooperative Soil Survey
U.S.A.

LOCATION REILLY PR

Established Series
Rev. JLL/GRB
08/1999

REILLY SERIES

The Reilly series consists of very deep, excessively drained, rapid permeable soils on flood plains adjacent to streams. They formed in stratified sediments of gravel and sand. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 70 inches. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Sandy-skeletal, mixed, isohyperthermic Mollic Udifluvents

TYPICAL PEDON: Reilly gravelly loam - sugarcane. (Colors are for moist soil.)

Ap--0 to 9 inches; dark brown (10YR 3/3) gravelly silt loam; weak fine granular structure; friable; slightly sticky, nonplastic; many fine roots; moderately acid; abrupt smooth boundary. (7 to 16 inches thick)

C1--9 to 16 inches; dark grayish brown (10YR 4/2) very gravelly sand; massive; very friable; few fine roots; moderately acid, about 60 percent, by volume, pebbles; few thin silty and clayey layers; abrupt smooth boundary.

C2--16 to 48 inches; clean, coarse sand and gravel; about 70 percent, by volume, coarse gravel, 2 to 3 inches in diameter.

TYPE LOCATION: Suroeste SCD, San German Municipality, Puerto Rico. Approximately 1.0 miles northwest of the city of San German; from the intersection of P.R. Hwy. 102 and P.R. Hwy 347, about 490 feet north of P.R. Hwy. 347 on farm road, about 165 feet west of road in sugarcane field. San German topographic quadrangle; lat. 18 degrees 05 minutes 52 seconds N.; long. 67 degrees 02 minutes 43 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Thickness of the A horizon and depth to the sand and gravel ranges from 7 to 16 inches. Reaction ranges from very strongly acid to slightly acid throughout.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 and 3. Texture is loam, silt loam, or their gravelly analogs. Content of pebbles ranges from 25 to 35 percent, by volume.

The C horizon has hue of 10YR, value of 3 or 4, and value of 3 to 6. Texture is very gravelly sand or extremely gravelly sand. Content of pebbles ranges from 50 to 75 percent, by volume.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: The Reilly soils are on flood plains adjacent to streams. They formed in medium and moderately coarse-textured sediments stratified with gravel and sands in dominant proportions. Slope range from 0 to 2 percent. The climate is humid tropical. The average annual temperature ranges from 76 to 80 degrees F., and the average annual rainfall ranges from 65 to 75 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Bajura, Coloso, Dique, and Toa series. All of these soils are in flood plains. The poorly drained Bajura soils have more clay in the substratum. The somewhat poorly drained Coloso soils have more clay in the subsoil. The well drained Dique soils have more clay in the subsoil. The well drained Toa soils have more clay in the control section and have Mollic epipedons.

DRAINAGE AND PERMEABILITY: Excessively drained; rapid permeability.

USE AND VEGETATION: Most areas of Reilly soils are in pasture. A few small acreage are in vegetable crops or sugarcane. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Soil Survey Area, Puerto Rico; 1968.

MLRA: 272.

National Cooperative Soil Survey
U.S.A.

LOCATION REPARADA PR

Established Series
Rev. RAB:LHR
06/2002

REPARADA SERIES

The Reparada series consists of very dark brown, A horizons, gray mottled clay B horizons over black muck.

TAXONOMIC CLASS: Fine, mixed, superactive, nonacid, isohyperthermic Mollic Fluvaquents

TYPICAL PEDON: Reparada clay - pasture.
(Colors are for moist soil.)

Ap--0-8 inches; Very dark brown (10YR 2/2) clay; common medium distinct brown (7.5YR 4/4) and few medium distinct dark reddish brown (2.5YR 2/4) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; very dark gray (N 3/) coatings on ped surfaces; mildly alkaline; gradual smooth boundary. (6 to 10 inches thick)

B2g--8-18 inches; Very dark gray (N 3/) clay; many coarse prominent dark greenish gray (5G 4/1) mottles; massive; firm, slightly sticky, slightly plastic; few fine roots; few partially decomposed plant residues; mildly alkaline; gradual smooth boundary. (6 to 12 inches thick)

110C--18-6 inches plus; Black (10YR 2/1) decomposed, mildly alkaline organic soil material - muck.

TYPE LOCATION: Sudeste SCD, Puerto Rico, municipality of Arroyo, from kilometer marker 131.6 of Highway 3, 0.1 mile south, 0.14 mile east, 0.4 mile south on dirt road, 40 feet east of road; 250 feet north of coconut field.

RANGE IN CHARACTERISTICS: Depth to the organic horizon ranges from 12 to 20 inches. The soils are saturated for 3 months or more. The reaction of all horizons ranges from neutral through moderately alkaline.

The A horizon is very dark gray (10YR 3/1; N3/), black (10YR 2/1; N/4), very dark brown (10YR 2/2) or very dark

grayish brown (10YR 3/2; 2.5Y 3/2). Mottles range from few through common and are in reddish hues and high chromas. Texture of A horizons is clay or silty clay.

The B horizon ranges from very dark gray (10HR 3/1; N 3/),through gray (10YR 6/1; N 6/), or the greenish and bluish hues of the gley chart. Structure is weak subangular blocky or structureless.

Organic layers range from hemic to sapric.

COMPETING SERIES: These are the Bajura, Coloso, Corcega, Fortuna, Igualdad, Maunabo, Perchas, Pinones, Santoni, Talante, and Vayas series. All these soils lack buried organic layers except the Pinones soils which have strongly through extremely acid reaction in the

control section. The Bajura and Santoni soils have COLE values of more than .09 and slickensides in the control section. The Coloso and Corcega soils have subhorizons with colors of chroma 3 or more. The Fortuna, Manuabo, and Perchas soils have acid reactions in the control sections. Igualdad soils have sandy or sandy-skeletal lower control sections. The Talante soils have coarse-loam over sandy and Vayas have fine textured control sections.

GEOGRAPHIC SETTING: The Reparada soils occur on nearly level coastal lowlands with slope gradients of 0 to 2 percent. The regolith is clayey sediments of mixed origin which overlie decomposed and partially decomposed organic materials. The climate is semiarid tropical. Average annual rainfall is 30 to 40 inches. The mean annual temperature is about 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Catano and Poncena series and the land type Tidal flats. The Catano soils have sandy control sections. The Poncena soils are fine textured. The land type Tidal flats are flooded by the sea during high tide.

DRAINAGE AND PERMEABILITY: Poorly drained. Runoff is slow and permeability is very slow. Soils are saturated 3 months or more a year.

USE AND VEGETATION: Natural vegetation consists of hydrophytic plants, Para grass, and shrubs. These soils are used for sugarcane when drained.

DISTRIBUTION AND EXTENT: Semiarid coastal areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico: 1942.

REMARKS: The Reparada soils were placed in the Half-Bog great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION RIO ARRIBA PR

Established Series
Rev. LHR
06/2002

RIO ARRIBA SERIES

The Rio Arriba series have brown, fine texture, plastic A horizons and yellowish brown, fine textured B2t horizons.

TAXONOMIC CLASS: Fine, mixed, subactive, isohyperthermic Vertic Paleudults

TYPICAL PEDON: Rio Arriba clay - sugarcane.
(Colors are for moist soil unless otherwise stated.)

Ap--0-8 inches; Brown (10YR 4/3) clay; weak coarse granular structure; hard, firm slightly sticky, plastic; many fine roots; neutral; clear smooth boundary. (4 to 10 inches thick)

B21t--8-16 inches; Yellowish brown (10YR 5/8) clay; moderate coarse prismatic breaking to weak medium subangular blocky structure with yellowish brown (10YR 5/4) thin continuous coatings on vertical surfaces of peds and patchy coatings on horizontal ped surfaces; hard, firm, slightly sticky, plastic; common fine roots; common fine black nodules; medium acid; clear smooth boundary. (6 to 12 inches thick)

B22t--16-28 inches; Yellowish brown (10YR 5/6) clay with common medium distinct yellowish red (5YR 4/6) mottles; weak coarse angular blocky with few slickensides and pressure faces; firm, slightly sticky, plastic, many fine black nodules; few fine roots; neutral; clear wavy boundary. (10 to 20 inches thick)

B23t--28-60 inches; Reddish yellow (7.5YR 6/6) clay with many medium distinct red (2.5YR 5/6) mottles; massive with few slickensides and pressure faces; firm, slightly sticky, plastic, many fine black nodules; mildly alkaline.

TYPE LOCATION: Turabo SCS, Puerto Rico; 0.4 kilometers west of the town of Gurabo on the Gurabo Experiment substation; 800 feet east of the western boundary of the farm and 600 feet north of the railroad tracks.

RANGE IN CHARACTERISTICS: Thickness of the solum is more than 60 inches. Base saturation at 50 inches below the top of the argillic horizon is 60 percent or more. The A horizon has colors in hues of 10YR or 7.5YR, values of more than 3 and chromas of 3 or 4. The B horizon has colors in hues of 10YR or 7.5YR, values of 4 through 6 and chromas of 4 through 8. Cracks occur at 20 inches and COLE values of 0.09 or more for more than 20 inches of B horizon. Fine clay content is higher in the B horizon than the A. The structure of the B horizon ranges from weak to moderate. Depth to the horizon with red mottles ranges from 20 to 42 inches. The soil ranges from medium acid through mildly alkaline.

COMPETING SERIES: These are the Fajardo, Juncal, Machete, San Sebastian, and Tanama series, all of which lack the .09 COLE value common to the VERTIC subgroups. The Fajardo soils are more acid, have gray mottles in the lower part. The Juncal soils have free carbonates in the lower profile. The San Sebastian soils have more than 50 percent limestone rock fragments in the profile. The Tanama soils have hard limestone rock within 20 inches of the surface.

GEOGRAPHIC SETTING: The Rio Arriba soils occur on gently to strongly sloping alluvial fans and terraces above the river flood plains. Slope gradients range from 2 to 12 percent. The soil formed in fine textured sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 65 inches and the mean temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Caguabo, Gurabo, Juncos, Mabi, and Mucara series. The Caguabo, Gurabo, Juncos, Mabi, and Mucara soils lack argillic horizons and occur above the Rio Arriba soils in the landscape, with the exception of Guarabo and Mabi which occur at lower positions.

DRAINAGE AND PERMEABILITY: Moderately well drained, medium to rapid runoff; moderately slow permeability.

USE AND VEGETATION: Most of the acreage is in sugar cane and pasture.

DISTRIBUTION AND EXTENT: Humid inner valleys of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: These soils were formerly classified in the yellowish-brown Lateritic intergrading to the Grumusols great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION SABANA PR

Established Series
Rev. RAB:LHR
04/2000

SABANA SERIES

The Sabana series is a member of the clayey, mixed, isohyperthermic family of Lithic Dystropepts. These acid soils have thin, very dark gray, silty clay loam, A horizons and yellowish red, clay or silty clay B horizons, over hard volcanic rock.

TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic Lithic Dystrudepts

Ap--0 to 4 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium granular structure; firm, slightly sticky, slightly plastic; common fine roots; common fine volcanic fragments; strongly acid; clear wavy boundary. (2 to 6 inches thick)

B1--4 to 12 inches; dark grayish brown (10YR 4/2) silty clay; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine pores; few thin clay films; few fine volcanic rock fragments; strongly acid; clear smooth boundary. (4 to 8 inches thick)

B2--12 to 18 inches; yellowish red (5YR 5/6) clay; many coarse distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine pores; few thin patchy clay films; common fine volcanic rock fragments; strongly acid; abrupt smooth boundary. (4 to 8 inches thick)

R--18 to 21 inches plus; consolidated volcanic rock.

TYPE LOCATION: Este SCD, Puerto Rico; 1.5 miles from Highway 3 on Highway 925, 150 feet north of Parcelas Junquitos.

RANGE IN CHARACTERISTICS: Depth to the hard volcanic rock is from 10 to 20 inches. Base saturation is less than 50 percent in some part of the epipedon or cambic horizons. CEC is 24 or more meq/100 grams of clay in all horizons to the lithic contact. Reaction through the solum is strongly or very strongly acid.

The A horizon has colors of dark brown (7.5YR 3/2, 4/2; 10YR 3/3, 4/3), very dark gray (10YR 3/1), very dark grayish brown (10YR 4/2). Texture is silty clay loam or clay loam. Coarse fragments vary from few through common.

The B horizon has colors of dark yellowish brown (10YR 4/4) through brownish yellow (10YR 6/8), brown (7.5YR 4/4) through reddish yellow (7.5YR 6/8) or reddish brown (5YR 4/4) through reddish yellow (5YR 6/8). Texture of the B horizon is clay loam, silty clay loam, silty clay or clay. Clay films are thin and very patchy; they do not meet the requirements of an argillic horizon.

COMPETING SERIES: These are the Anones, Cramer, Descalabrado, Diamond, Malaya, Mariana, Pandura, Parcelas, Santa Marta, and Tanama series. The Anones, Mariana, and Santa Marta soils lack hard rock within 20 inches of the surface. Diamond and Descalabrado soils have dryer soil moisture regimes. Diamond and Pandura soils have loamy control sections. Cramer and Tanama soils have argillic horizons, and Cramer soils have mollic epipedons. Malaya soils have higher base saturation throughout the solum. Parcelas soils have sola thicker than 20 inches and lack the underlying rock.

GEOGRAPHIC SETTING: The Sabana soils occur on steep slopes with slope gradients from 20 to 60 percent. The regolith is thin, fine textured residuum of partially weathered volcanic rocks. The climate is humid tropical. The average annual rainfall is 80 to 90 inches. The mean annual temperature is 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Caguabo, Juncos, Mucara, and Naranjito series. The Caguabo soils are less acid and have coarser textured control sections. The Juncos and Mucara soils have montmorillonitic mineralogy and higher base saturation. Naranjito soils have argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid. Permeability is moderate.

USE AND VEGETATION: The soils are used for pasture of mainly native grasses. Few small areas are used for minor crops.

DISTRIBUTION AND EXTENT: Humic volcanic uplands of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The Sabana series was placed in the Gray Brown Podzolic great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION TALANTE PR

Established Series
Rev. RAB-WEM
06/2002

TALANTE SERIES

The Talante series have moderately fine textured brown to grayish-brown mottled A horizons, medium textured gleyed B horizons and coarse textured gleyed C horizons.

TAXONOMIC CLASSCoarse-loamy over sandy or sandy-skeletal, mixed, subactive, acid, isohyperthermic Aeric Fluvaquents

TYPICAL PEDON: Talante clay loam (Colors are for moist soil unless otherwise noted).

Apg-- 0 to 4 inches; dark brown (10YR 4/3) clay loam, many medium distinct gray (10YR 5/1) and brown (7.5YR 4/4) mottles; weak fine subangular blocky structure breaking to granular structure; friable, slightly plastic; very strongly acid; clear smooth boundary. (6 to 10 inches thick.)

Alg--4 to 10 inches; grayish-brown (10YR 5/2) sandy clay loam, many medium prominent dark gray (5Y 4/1) and yellowish-red (5YR 4/8) mottles; structureless, massive; friable, slightly plastic; many mica flakes; strongly acid; clear smooth boundary. (4 to 10 inches thick.)

Blg-- 10 to 18 inches; brown (10YR 5/3) light loam, many medium prominent gray (5Y 5/1) and brown (7.5YR 4/4) mottles; structureless, massive; friable; strongly acid; clear smooth boundary. (6 to 12 inches thick.)

IIC1g--18 to 40 inches; mixed brown (7.5YR 4/4) and gray (5Y 5/1) loamy sand; structureless, massive; very friable; strongly acid; clear smooth boundary. (14 to 25 inches thick.)

IIIC2g--40 to 58 inches; gray (2.5Y 5/1) coarse sand, many medium prominent yellowish-brown (10YR 5/6) mottles; structureless, single grain; loose; strongly acid.

TYPE LOCATION: Yabucoa, Puerto Rico; 1000 meters northeast of Central Roig and 600 feet north of the Guayanes River.

RANGE IN CHARACTERISTICS: Color of the Ap horizon ranges from very dark grayish-brown (10YR 3/2) to yellowish-brown (10YR 5/3) and has common to many gray (10YR 5/1), dark brown (7.5YR 4/4), dark gray (5Y 4/1), yellowish-red (5YR 4/8) or dark reddish-brown (5YR 3/4) mottles. Texture of the Ap horizon ranges from sandy clay loam to clay loam.

Color of the upper part of control section ranges from grayish-brown (10YR 5/2) to brown (10YR 5/3) and contains common to many dark gray (5Y 4/1) to gray (5Y 5/1) mottles. Texture ranges from sandy loam to loam.

The IIC horizon ranges in color from dark brown (10YR 3/3-7YR 4/4), brown (10YR 5/3), gray (2.5YR 5/1) to dark greenish-gray (5BG 4/1) and contains common to many reddish-brown (5YR 4/6), dark reddish-brown (5YR 3/4), brownish-yellow (10YR 6/8) or dark bluish-gray (5B 4/1) mottles. Texture of the IIC horizons range from sandy loam to loam. Depth to water table ranges from 20 to 40 inches.

COMPETING SERIES: To date no other soils that are closely related taxonomically have been recognized.

GEOGRAPHIC SETTING: The Talante soils are on nearly level flood plains having slope of 0 to 1 percent. The regolith is medium to coarse textured sediments derived from granitic rock. The climate is humid tropical. Average annual precipitation is 87 inches, and the average annual temperature is 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are in the Fortuna, Josefa, Maunabo, Reilly, Vivi and Yabucoa soils, which have formed in somewhat similar sediments. The Maunabo and Fortuna soils are similar in color and drainage but are finer textured. The Josefa soils are somewhat poorly drained; they have higher chroma mottles, finer texture and are on slightly higher topographic positions. The Yabucoa soils are brighter colored and moderately fine textured soils. The Reilly soils are shallow gravelly soils and are on levees along the streams. The Vivi soils are deep and well drained and are on higher well drained topographic positions on the level flood plains.

DRAINAGE AND PERMEABILITY: Poorly drained. Runoff is slow, and permeability is moderate.

USE AND VEGETATION: Most of the soil is cultivated and used for growing sugar cane.

DISTRIBUTION AND EXTENT: In the humid parts of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1932

REMARKS: The Talante series was formerly classified in the Low Humic-Gley great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION TEJA PR

Established Series
Rev. RAB-LHR-RLV
06/2002

TEJA SERIES

The Teja series consists of shallow, well drained, rapidly permeable soils. They formed in gravelly residuum from plutonic rocks. These soils are on side slopes in uplands. Slopes range from 12 to 40 percent.

TAXONOMIC CLASS: Loamy-skeletal, mixed, subactive, acid, isohyperthermic Lithic Udorthents

TYPICAL PEDON: Teja gravelly sandy loam - pasture
(Colors are for moist soil.)

A--0 to 6 inches; dark brown (10YR 3/3) gravelly sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; common fine roots; many fine quartz grains; 20 percent rock fragments; very strongly acid; clear smooth boundary. (4 to 10 inches thick)

C1-- 6 to 14 inches; brown (10YR 4/3) and yellowish brown (10YR 5/4) very gravelly sandy loam; single grain; loose, nonsticky, nonplastic; few fine roots; 40 percent angular rock fragments; very strongly acid; abrupt smooth boundary. (6 to 10 inches thick)

R--14 inches; hard, coarse grained plutonic rock.

TYPE LOCATION: Este SCD, Puerto Rico; municipality of Yabucoa, Barrio Candelero Abajo, 25 feet south of kilometer marker 2.7 of Highway 906.

RANGE IN CHARACTERISTICS: Depth to the hard plutonic rock ranges from 10 to 20 inches. CEC is 24 meq/100 grams of clay or more in all horizons above the lithic contact. Reaction ranges from strongly to very strongly acid. Weighted average of gravel in the A and C horizon ranges from 35 to 50 percent.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3 and chroma of 2 or 3.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. Texture ranges from very gravelly loam to very gravelly sandy loam.

COMPETING SERIES: There are no competing series in the family. Soils in similar families include the Reilly, San German, Sabana, Caguabo, Descalabrado, Diamond, Guayama, Malaya, Southgate and Tanama series. The Reilly soils are do not have hard rock within 20 inches of the surface. The San German soils have carbonatic mineralogy and are dry for more than 90 cumulative days in most year. The Sabana, Caguabo, Diamond, Malaya and Southgate soils have cambic horizons. The Guayama and Tanama soils have thin argillic horizons. The Descalabrado soils have mollic epipedons and cambic horizons.

GEOGRAPHIC SETTING: The Teja soils occur in strongly sloping to steep sideslopes with slope gradients of 12 to 40 percent. The regolith consists of gravelly, shallow residuum derived from plutonic rocks, mainly quartz diorite or granodiorite. The climate is humid tropical. The average yearly rainfall is 80 to 90 inches. The mean annual temperature is from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Mayo, Patillas and Pandura series in addition to the Candelero and Cayagua series all of which lack hard rock within 20 inches. The Mayo soils occur in footslopes and terraces at lower positions. The Patillas and Pandura series occur in similar land forms but have formed in more weathered and softer plutonic rocks. The Candelero and Cayagua soils occupy terrace and footslope positions and have dominant colors with chroma of 2 or less.

DRAINAGE AND PERMEABILITY: Well drained, rapid runoff, rapid permeability.

USE AND VEGETATION: Most of the areas in native grasses and used as pasture. Few small areas are in sugar cane and minor crops.

DISTRIBUTION AND EXTENT: Humid plutonic uplands. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, 1942.

REMARKS: The Teja series was placed in the Gray-Brown Podzolic great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION TOA PR

Established Series
Rev. JLL/GRB
06/2002

TOA SERIES

The Toa series consists of very deep, well drained, moderately permeable soils are on river flood plains. They formed in stratified alluvial sediments of mixed origin. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 70 inches. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Fluvaquentic Hapludolls

TYPICAL PEDON: Toa silty clay loam - sugarcane. (Colors are for moist conditions.)

Ap--0 to 8 inches; dark brown (10YR 3/3) silty clay loam; weak fine granular structure; friable; slightly sticky, slightly plastic; common fine roots; many fine sand grains; about 3 percent, by volume, volcanic fragments 1/4 to 1/2 inch in diameter; strongly acid; clear smooth boundary.

A--8 to 17 inches; dark brown (10YR 3/3) silty clay loam; weak medium subangular blocky structure, parting to weak fine granular; friable; slightly sticky, slightly plastic; few fine roots; common fine black (10YR 2/1) nodules; neutral; clear smooth boundary. (Combined thickness of the Ap and A horizons ranges from 12 to 20 inches)

Bw--17 to 29 inches; dark yellowish brown (10YR 3/4) silty clay loam; weak medium and coarse subangular blocky parting to weak fine subangular blocky; friable; slightly sticky, slightly plastic; few fine roots, few fine vesicular pores, common fine black (10YR 2/1) nodules; few fine distinct dark brown (7.5YR 4/4) masses of iron accumulation; slightly alkaline; clear smooth boundary. (8 to 15 inches thick)

BC--29 to 43 inches; dark brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; few brick fragments found at the top of this horizon; few fine distinct reddish brown (5YR 5/3) masses of iron accumulation; slightly alkaline; clear smooth boundary. (0 to 15 inches thick)

C--43 to 64 inches; dark yellowish brown (10YR 4/4) clay loam; massive; friable; slightly sticky, slightly plastic; few fine black (10YR 2/1) nodules; few fine faint yellowish brown (10YR 5/6) masses of iron accumulation; few fine faint light gray (10YR 7/1) areas of iron depletions; slightly alkaline.

TYPE LOCATION: Suroeste SCD, Puerto Rico. Approximately 0.9 mile southwest of the Lavadero community from the intersection of P.R. Hwy. 2 and P.R. Hwy. 345, about 2,300 feet south of P.R. Hwy. 345 on dirt road from the intersection of the highway at the kilometer marker 2.5, and about 650 feet east of road in sugarcane field. Rosario topographic quadrangle; lat. 18 degrees 07 minutes 31 seconds N., long. 67 degrees 06 minutes 47 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 35 inches. Thickness of the mollic epipedon ranges from 12 to 20 inches. Reaction ranges from strongly acid to neutral in the Ap and A horizons, and from neutral to slightly alkaline in the Bw, BC, and C horizons. Organic carbon does not decrease regularly with depth. Fragments of volcanic rock ranges from 0 to 5 percent, by volume, throughout the profile.

The Ap or A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is silty clay loam or silty clay. Fine volcanic fragments range from 0 to 5 percent, by volume.

The Bw horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown range from none to common.

The BC horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown range from none to common.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown and gray range from few to many. Texture is silty clay loam or clay loam. Lenses of sand may be present.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Toa soils are on river flood plains. They formed in sediments of mixed origin. Slopes range from 0 to 2 percent. The climate is humid tropical. The average annual air temperature ranges from 77 to 79 degrees F., and the average annual precipitation ranges from 60 to 82 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Bajura, Coloso, Dique, Reilly, and Vivi series. All of these soils are in flood plain positions. Bajura, Coloso, and Dique soils lack mollic epipedons. In addition, Bajura soils are poorly drained, Coloso soils are somewhat poorly drained, and Dique soils have fine-loamy control sections. The excessively drained Reilly soils have sandy-skeletal control sections. The somewhat excessively drained Vivi soils have coarse-loamy control sections.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of Toa soils are used for the production of sugarcane. Some areas are in tame grasses and used for pasture. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

MLRA: 272, 273.

National Cooperative Soil Survey
U.S.A.

LOCATION UTUADO PR

Established Series
Rev. GRB
02/2002

UTUADO SERIES

The Utuado series consists of very deep, somewhat poorly drained, moderately rapid permeable soils on middle and lower side slopes of strongly dissected uplands. They formed in residuum in the plutonic uplands that weathered from granodiorite of the Rio Blanco stock. Near the type location, the mean annual temperature is about 69 degrees F., and the mean annual precipitation is about 120 inches. Slopes range from 25 to 95 percent.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, isothermic Aquic Humic Dystrudepts

TYPICAL PEDON: Utuado gravelly sandy loam - forest. (Colors are for the moist conditions.)

Oi-- 0 to 1 inches; many fine, medium, and coarse roots, forming a mat; abrupt smooth boundary. (0 to 5 inches.)

A-- 1 to 2 inches; dark brown (10YR 3/3) gravelly sandy loam; moderate very fine and fine subangular blocky structure; common fine, medium, and coarse roots; many fine interstitial pores; about 20 percent, by volume, pebbles; strongly acid; abrupt smooth boundary. (4 to 8 inches.)

Bw1-- 2 to 7 inches; dark brown (10YR 3/3) sandy loam; weak fine and medium subangular blocky structure; very friable; few medium roots; about 10 percent, by volume, stones; common medium distinct strong brown (7.5YR 5/8) masses of iron accumulations; common medium distinct gray (10YR 5/1) areas of iron depletions; strongly acid; clear smooth boundary.

Bw2-- 7 to 13 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; few very fine and fine roots; few fine tubular pores; about 10 percent, by volume, stones; common medium distinct gray (10YR 5/1) areas of iron depletions; strongly acid; abrupt smooth boundary. (Combined thickness of the Bw horizons ranges from 14 to 23 inches in thickness.)

C-- 13 to 28 inches; yellowish brown (10YR 5/6) loamy sand; weak fine and medium subangular structure; common very fine, fine, and medium roots; few fine tubular pores; strongly acid; gradual smooth boundary.

Cr-- 28 to 61 inches; variegated very pale brown (10YR 8/2), black (10YR 2/1) and brown (10YR 5/3) saprolite with a loamy sand texture; about 40 percent, by volume, stones; strongly acid.

TYPE LOCATION: Naguabo Municipio, Este SCD, Caribbean National Forest, Puerto Rico. Approximately 75 feet west of kilometer marker 14 on P.R. Road 191. El Yunque topographic quadrangle; lat. 18 degrees 17 minutes 38 seconds N., long. 65 degrees 47 minutes 32 seconds W. PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 18 to 31 inches. Reaction ranges from extremely acid to strongly acid throughout. Pebbles, cobbles, and/or stones range from 0 to 20 percent, by volume, throughout.

The Oi horizon, where present, is composed of roots, forming a mat.

The A horizon has hue from 7.5YR to 2.5Y, value from 2 to 5, and chroma from 1 to 4. Texture is sandy loam, loam, their gravelly, cobbly, or stony analogs.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma from 3 to 8. Redoximorphic features in shades of yellow, brown, and gray range from few to many, decreasing with depth and may be absent in the lower Bw horizons of some pedons. Texture is sandy loam, loam, their gravelly, cobbly, or stony analogs..

The C horizon has hue of 7.5YR to 2.5YR, value of 4 to 6, and chroma of 4 to 8. Texture is loamy sand, sandy loam, their gravelly, cobbly, or stony analogs..

The Cr horizon is composed of saprolite that can be dug with a spade and has a texture of loamy sand or sandy loam.

COMPETING SERIES: These are no other known series in the same family.

GEOGRAPHIC SETTING: Utuado soils are on middle and lower sideslopes of strongly dissected uplands. They formed in residuum that weathered from granodiorite of the Rio Grande stock. The climate is humid tropical. Slopes range from 25 to 95 percent. The average annual temperature ranges from 67 to 71 degrees F., and the average annual precipitation ranges from 80 to 150 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Ciales, Guayabota, Icacos, Los Guineos, Picacho, and Yunque soils. The poorly drained Ciales soils are on lower positions and have fine-loamy control sections. The poorly drained Guayabota soils are on higher positions and are shallow to bedrock. Icacos soils are on lower adjacent flood plains and have fine-loamy control sections. The well drained Los Guineos soils are on higher positions and have more clay in the control section. Picacho soils are on higher positions and have fine-loamy control sections. The moderately well drained Yunque soils are on higher positions and have more clay in the control sections.

DRAINAGE AND PERMEABILITY: Well drained; moderately rapid permeability.

USE AND VEGETATION: All areas of Utuado soils are forested and used for recreation, research, wildlife habitat, and watershed protection. The vegetation consists of native and introduced species of hardwoods, sierra palms, and tree ferns.

DISTRIBUTION AND EXTENT: Tropical rain forests of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

REMARKS: Diagnostic horizons and features recognized in this pedon.

Ochric epipedon - the zone from 0 to 1 inch (A horizon).

Cambic epipedon - the zone from 1 to 12 inches (Bw1 and Bw2 horizons).

Aquic feature - episaturation beginning at about 1 inch, but depletions are not dominate.

ADDITIONAL DATA: NSSL Characterization Data Pedon No. 86P0252; Soil Survey No. S85PR-103-001; sample by NSSL, Lincoln NE.

National Cooperative Soil Survey
U.S.A.

LOCATION VAYAS PR

Established Series
Rev. JLL/GRB
07/2001

VAYAS SERIES

The Vayas series consists of very deep, poorly drained, slowly permeable on flood plains. They formed in clayey alkaline alluvium of mixed origin. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Fine, smectitic, isohyperthermic Vertic Endoaquolls

TYPICAL PEDON: Vayas silty clay - pasture. (Colors are for moist conditions.)

A1--0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay; weak fine granular structure; friable; slightly sticky, slightly plastic; many fine roots; neutral; clear wavy boundary. (3 to 8 inches thick)

Bwg1--4 to 11 inches; dark gray (10YR 4/1) silty clay; weak medium subangular blocky structure; friable; slightly sticky, plastic; many fine roots; neutral; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; gradual wavy boundary.

Bwg1--11 to 18 inches; very dark gray (10YR 3/1) silty clay; weak fine subangular blocky structure; firm; slightly sticky, plastic; common fine roots; many medium distinct red (2.5YR 4/8) masses of iron accumulation; many medium distinct gray (N 5/0) areas of iron depletions; slightly alkaline; clear wavy boundary. (Combined thickness of the B horizons ranges from 9 to 22 inches)

Cg1--18 to 22 inches; dark gray (10YR 4/1) clay; massive; firm, sticky, plastic; few fine roots; few fine black (10YR 2/1) concretions; many medium distinct brownish yellow (10YR 6/8) and common medium distinct yellowish red (5YR 5/8) masses of iron accumulation; slightly alkaline; abrupt smooth boundary.

Cg2--22 to 36 inches; very dark gray (10YR 3/1) clay; common medium distinct yellowish brown (10YR 5/6) and few

fine distinct yellowish red (5YR 5/8) masses of iron accumulation; massive; firm, sticky, plastic; few fine roots; few salt crystals; moderately alkaline; clear wavy boundary.

Cg3--36 to 50 inches; black (N 2/0) clay; massive; firm; sticky, plastic; common fine salt crystals; few fine distinct red (2.5YR 4/8) and dark yellowish brown (10YR 4/4) masses of iron accumulation; moderately alkaline.

TYPE LOCATION: Cabo Rojo Municipality, Puerto Rico. Approximately 1.4 miles southeast of the Betances community on dirt road from the intersection of P. R. Hwy. 101 and P.R. Highway 103, about 175 feet east of dirt road. Puerto Real topographic quadrangle; lat. 18 degrees 00 minutes 50 seconds N., long. 67 degrees 07 minutes 34 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 12 to 30 inches. Reaction ranges from slightly acid to slightly alkaline in the A and Ap horizons, from neutral to slightly alkaline in the Bwg horizons, and from slightly alkaline to moderately alkaline in the BCg and Cg horizons. Organic matter decreases regularly as depth increases.

The A horizon has hue of 10YR and 2.5Y, value of 2 or 3, and chroma of 2 or 3. It is silty clay or clay.

The Bwg horizons have hue of 10YR to 5Y, value of 3 through 5, and chroma of 2 or less. Masses of iron accumulations in shades of red, brown, and yellow range from common to many.

The Cg horizons have hue of 10YR and 5Y, value of 2 through 5, and chroma of 2 or less. Masses of iron accumulations in shades of red, brown, and yellow range from common to many. Salt crystals are fine and range from few to common. Sodium saturation in the upper 20 inches of the solum is less than 15 percent.

COMPETING SERIES: These are no other series in the same family.

GEOGRAPHIC SETTING: Vayas soils are on weakly dissected river flood plains. They formed in clayey alkaline alluvium of mixed origin. Slopes range from 0 to 2 percent. The climate is tropical semiarid. The mean annual temperature ranges from 78 to 80 degrees F., and the average annual rainfall ranges from 30 to 40 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Aguirre, and Fraternidad, and San Anton series. The Aguirre and Fraternidad soils are on alluvial fans and valley floors, and have COLE values of 0.09 or more in the sola. The San Anton soils are not mottled.

DRAINAGE AND PERMEABILITY: Poorly drained; slow permeability.

USE AND VEGETATION: Most areas of Vayas soil are planted to sugarcane or used for pasture. The vegetation consists of Para grass and other native and introduced species.

DISTRIBUTION AND EXTENT: Semiarid river flood plains of southern Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

MLRA: 273.

National Cooperative Soil Survey
U.S.A.

LOCATION VEGA ALTA PR

Established Series
Rev. BCD
06/2002

VEGA ALTA SERIES

The Vega Alta series consists of very deep, well drained, moderately permeable soils on coastal plains and terraces. They formed in clayey, iron-rich coastal plain sediments. Slopes range from 2 to 12 percent. The mean annual precipitation is about 76 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Hapludults

TYPICAL PEDON: Vega Alta clay loam - marker grass. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark yellowish brown (10YR 3/4) clay loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine black concretions; common fine roots; strongly acid; abrupt wavy boundary. (6 to 10 inches thick)

Bt1--8 to 14 inches; reddish yellow (7.5YR 6/8) and yellowish red (5YR 4/6) clay; weak medium and coarse subangular blocky breaking to moderate fine granular structure with few faint clay films on surfaces of peds and root channels; firm, slightly sticky, slightly plastic; many fine black concretions; few fine roots; strongly acid; clear wavy boundary. (5 to 10 inches thick)

Bt2--14 to 25 inches; red (2.5YR 4/8) and strong brown (7.5YR 5/8) clay; moderate medium and coarse subangular blocky breaking to weak medium blocky structure with common prominent clay films on faces of peds; firm, slightly sticky, slightly plastic; few fine black concretions; few fine roots; strongly acid; gradual wavy boundary. (9 to 13 inches thick)

Bt3--25 to 36 inches; red (2.5YR 4/8) brownish yellow (10YR 6/8), and red (7.5R 4/8) clay; weak medium and coarse subangular blocky structure with brownish yellow clay films in root channels; firm, nonsticky, slightly plastic; few fine quartz grains; very strongly acid; gradual wavy boundary. (9 to 14 inches thick)

Bt4--36 to 52 inches; dark red (10R 3/6), strong brown (7.5R 5/8), and light gray (5Y 7/1) clay; weak coarse subangular blocky structure with few faint clay films; friable, nonsticky, slightly plastic; very strongly acid; gradual wavy boundary. (14 to 18 inches thick)

C--52 to 84 inches dark red (10YR 3/6), brownish yellow (10YR 6/8), light gray (5Y 7/1) clay; massive; friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: San Juan SCD, Puerto Rico, Rio Piedras Experiment Station, section of farm north of Highway 1 to Caguas, 150 feet north of radio station, 50 feet south of trail, east of Rum Pilot Plant.

RANGE IN CHARACTERISTICS: Thickness of solum ranges from 43 to 65 inches and that of the Bt horizons from 37 to 55. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic horizon. Exchange capacity in the major part of the argillic is less than 24 meq. per 100 grams of clay. Organic matter content is 1.5 percent or less in the upper 6 inches of the argillic horizon. Plinthite in the C horizon occupies more than 10 percent by volume of the soil mass.

The A horizon is clay loam or silty clay. Colors of the A horizon are in hues of 10YR or 7.5YR, values and chromas of 3 or 4.

The Bt horizons are dominantly clayey. They range from weak coarse to moderate medium subangular blocky and clay films range from few faint to many prominent. Black concretions in the profile range from few to many.

COMPETING SERIES: These are the Alonso, Consumo, Corozal, Ingenio, Jagueyes, Moca, and Rio Piedras series, none of which contain plinthite. The Alonso soils are reddish brown throughout. The Consumo soils have thinner argillic horizons. The Corozal soils have low chroma mottles in the upper B horizon. The Ingenio soils have many quartz sand size grains and have uniform red colors throughout. The Jagueyes soils are coarser textured. The Moca soils are underlain by clays with high shrink-swell behavior. The Rio Piedras soils have more developed argillic horizons and higher exchange capacity.

GEOGRAPHIC SETTING: The Vega Alta soils occur on nearly level to moderately sloping coastal plains and terraces with slope gradients which range from 2 to 12 percent. The soil formed in fine textured, iron rich, red, brown, and gray coastal plains sediments. The climate is humid tropical. The mean annual precipitation is 76 inches and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bajura, Coloso, Toa, and Vega Baja, in addition to the competing Rio Piedras soils. The Bajura, Coloso, and Toa soils also occur at lower positions in the river flood plains. Bajura and Coloso soils are poorly drained and are dark grayish brown. Toa soils are well drained and are coarser textured. The Vega Baja soils are poorly drained and occur at slightly lower geomorphic terrace positions.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Used largely for production of sugar cane and for pasture.

DISTRIBUTION AND EXTENT: Humid northern coastal plains of Puerto Rico. This series is of limited extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Plinthic Tropudults to Clayey, mixed, isohyperthermic Plinthic Paleudults. The previous OSED date was 7/73.

Laboratory data show that these soils have 10 percent or more weatherable minerals in the 20 to 200 micron fraction of the upper 40 inches.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 8 inches (Ap horizon)

Argillic horizon - zone from 8 to 52 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION VEGA BAJA PR

Established Series
Rev. RLV
06/2002

VEGA BAJA SERIES

The Vega Baja series consists of very deep, somewhat poorly drained, slowly permeable soils on alluvial fans and coastal plains. They formed in alluvial sediments and the underlying coastal plain sediments. Slopes range from 0 to 35 percent.

TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Aquic Hapludalfs

TYPICAL PEDON: Vega Baja silty clay - Merker grass. (Colors are for moist soil.)

Ap--0 to 7 inches; dark brown (10YR 4/3) silty clay; weak fine granular structure; firm, slightly sticky, plastic; many fine roots; few fine black concretions; strongly acid; gradual wavy boundary. (4 to 12 inches thick)

A--7 to 12 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) silty clay; weak fine granular structure; firm, slightly sticky, plastic; many fine roots; few fine black concretions; strongly acid; abrupt wavy boundary. (4 to 12 inches thick)

Bt1--12 to 17 inches; dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) clay; weak coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few fine black concretions; black coatings on ped faces and root channels; very strongly acid; abrupt wavy boundary. (4 to 10 inches thick)

Bt2--17 to 32 inches; mixed strong brown (7.5YR 5/8) and gray (5Y 6/1) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; seams between peds and root channels filled with gray clay; few fine black concretions; very strongly acid; gradual wavy boundary. (8 to 16 inches thick)

BC--32 to 50 inches; brownish yellow (10YR 6/8) and light gray (N 7/0) silty clay with pockets of yellowish brown clay loam materials; weak coarse subangular blocky structure; slightly sticky, slightly plastic; few peds and fracture planes coated with black; root channels and worm burrows filled with gray clay; strongly acid; abrupt wavy boundary. (12 to 20

inches thick)

C1--50 to 55 inches; light gray (N 7/0) clay with many fine distinct strong brown (7.5YR 5/8) mottles; massive; sticky, plastic; moderately acid; abrupt wavy boundary. (4 to 12 inches thick)

C2--55 to 60 inches; light gray (N 7/0) and strong brown (7.5YR 5/8) silty clay; massive; sticky, plastic; medium acid.

TYPE LOCATION: San Juan SCD, Puerto Rico, Rio Piedras Experiment Station 200 feet north on road to Food Technology Laboratory, and 200 feet to the east of road. (Section of farm north of Highway 1 to Caguas)

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 32 to 70 inches. Thickness of the argillic horizon varies from 24 to 46 inches. These soils are slightly sticky or sticky and plastic. Base saturation ranges from 40 to 80 percent at 50 inches below the top of the argillic horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 8. It is clay, silty clay or silty clay loam. Reaction ranges from neutral to very strongly acid.

The Bt horizon has hue of 7.5YR, 10YR, or 5Y, value of 4 to 6, and chroma of 1 to 8. They are clay or silty clay. Consistence is slightly sticky or sticky and plastic. Reaction is neutral or very strongly acid.

The C horizons are silty clay or clay; sticky and plastic. Reaction varies from moderately acid to strongly acid.

COMPETING SERIES: There are no series in this family. The Candelero, Cayagua, Coloso, Corcega and Talante series are similar soils in related families. The Candelero soils have coarser textured profiles with less than 35 percent clay. The Cayagua soils are underlain by coarse textured saprolite of granitic rocks within 40 inches of the soil surface. The Coloso soils lack argillic horizons and have organic matter that does not decrease regularly with depth. The Corcega and Talante are coarser textured.

GEOGRAPHIC SETTING: The Vega Baja soils are nearly level soils on fine textured coastal plains and alluvial fans with slope gradients from 0 to 35 percent. They formed in coastal plains sediments overlain by alluvial sediments. The climate is humid tropical. The mean annual precipitation ranges from 76 to 80 inches, and the mean annual air temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Vega Alta, Sabana Seca, Coloso, Bajura and Toa series. The Vega Alta soils occur at higher elevations in the coastal plain, are well drained and have more than 5 percent plinthite in the B horizon. The Sabana Seca soils are poorly drained and have plinthite. The Coloso, Bajura, and Toa soils occur at lower geomorphic positions in the river flood plain. The Toa and Coloso soils have organic matter that does not decrease regularly with depth and the Bajura soils have horizons with COLE values of more than 0.09.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; slow permeability.

USE AND VEGETATION: Most of the acreage of this soil is used for the production of sugarcane, and tame grasses and used as pasture.

DISTRIBUTION AND EXTENT: Humid northern coastal plains of Puerto Rico. The series is of minor extent, about 2,100 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: This revision updates the classification to Aeric Endoaqualfs.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 12 inches (Ap and A horizon)

Argillic horizon - zone from 12 to 37 inches (Bt horizon)

ADDITIONAL DATA: Characterization data are available for the typical pedon S61-PR-9-1.

MLRA = 272

SIR = PR0059

National Cooperative Soil Survey
U.S.A.

LOCATION VIA PR

Established Series
Rev. BCD
08/2000

VIA SERIES

The Via series consists of very deep, well drained, moderately permeable soils on high stream terraces. They formed in stream sediments. Slopes range from 2 to 12 percent. The mean annual precipitation is about 75 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, semiactive, isohyperthermic Typic Paleudalfs

TYPICAL PEDON: Via silty clay loam - sugar cane. (Colors are for the moist soil.)

Ap--0 to 8 inches; dark grayish brown (10YR 4/2), brown (10YR 5/3) dry silty clay loam; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; common fine dark concretions; few worm casts; few cobbles and pebbles at contact with B horizon; extremely acid; abrupt smooth boundary. (6 to 14 inches thick)

Bt1--8 to 23 inches; reddish brown (5YR 4/4) clay loam; weak medium subangular blocky structure; very hard; firm, slightly sticky, slightly plastic; common fine roots; few faint clay films on vertical ped faces; many fine dark mineral grains; common fine rock fragments; slightly acid; clear smooth boundary. (10 to 16 inches thick)

Bt2--23 to 47 inches; yellowish red (5YR 4/8) clay loam; weak medium subangular blocky structure; very hard; firm, slightly sticky; slightly plastic; few fine roots; few faint clay films; common fine dark minerals; many fine and medium rock fragments; slightly acid; gradual wavy boundary. (14 to 30 inches thick)

2C--47 to 62 inches plus; dark brown (7.5YR 4/4) gravelly clay loam; structureless massive; hard, firm, slightly sticky; more than 70 percent by volume coarse fragments; medium acid.

TYPE LOCATION: Este SCD, Puerto Rico, municipality of Juncos; 0.43 miles west of kilometer marker 21.9 of Highway 3; 3,500 feet east of school house.

RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the 2C gravelly horizons vary from 30 to 60 inches. Few to many rock fragments are found in the solum. Soil reaction ranges from extremely acid in the surface to slightly acid in the lower horizons. Mineralogy is mixed. Mean annual soil temperature at 20 inches depth is from 72 to 78 degrees F. and the difference between mean summer and mean winter soils temperatures is less than 9 degrees F. Base saturation (by sum of cations) is 35 percent or more at 50 inches from the top of the argillic horizon. These soils are usually moist and never dry for as long as 90 cumulative days in most years.

The A horizons have textures that range from silty clay loam to clay loam. The colors are in hues of 10YR to 5YR, values of 4 to 5, chromas of 2 to 4.

The Bt horizons have textures from silty clay loam to clay loam but are always less than 35 percent clay. Colors are in hues of 7.5YR and 5 YR, values of 4 to 6 and chromas of 4 to 8. Structure varies from weak medium to coarse subangular blocky. Clay films vary from few faint to common distinct.

Rock fragments in the 2C horizons vary from 50 to 80 percent by volume.

COMPETING SERIES: These are the San Sebastian, Juncal, Tanama, Rio Arriba, Amelia, Machete, Glynn and Fajardo series. The San Sebastian soils have more than 35 percent coarse fragments in their argillic horizons. The Juncal soils have more than 35 percent clay in their argillic horizons. The Tanama soils have hard rock within 20 inches of the surface. The Rio Arriba soils have subhorizons with more than 0.09 COLE values. The Amelia, Machete and Glynn soils have subhorizons that are dry for 90 cumulative days or more in most years. The Fajardo soils have argillic horizon that extend beyond 60 inches of the surface.

GEOGRAPHIC SETTING: The Via soils occur on gently to moderately sloping high stream terraces, with slope gradients from 2 to 12 percent. The regolith consists of moderately fine textured sediments underlaid by coarse textured gravelly or cobbly sediments. The climate is humid tropical. The average annual rainfall ranges from 70 to 80 inches and the average annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS. These are the Rio Arriba, Mabi, Junquitos, Mucara and Naranjito series. The Rio Arriba soils occur in similiar positions but have fine textured sola and mottled red fine textured parent materials. The Mabi soils occupy alluvial fan positions and have high COLE values. The Junquitos soils occupy footslopes and alluvial fan positions and have low chroma mottles in their profiles. The Mucara and Naranjito soils are on steep sideslopes and are underlaid by volcanic rock.

DRAINAGE AND PERMEABILITY: Well drained with medium runoff. Permeability is moderate.

USE AND VEGETATION: Cultivate areas are used for growing sugar cane. There are some areas in native and improved grasses and used as pasture.

DISTRIBUTION AND EXTENT. Humid sections of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Typic Tropudalfs to Fine-loamy, mixed, isohyperthermic Typic Paleudalfs. The previous OSED date was 1/69.

As originally mapped, the Via series contained moderately deep, aquic soils which are now classified in the Junquitos series.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 8 inches (Ap horizon)

Argillic horizon - zone from 8 to 47 inches (Bt horizons)

Pale clay curve - Less than 20 percent clay cutback in Bt and 2C horizons and value of 4 in Bt horizon.

National Cooperative Soil Survey
U.S.A.

LOCATION VIEQUES PR

Established Series
Rev. RAB:LHR
08/2000

VIEQUES SERIES

The Vieques series have dark brown loam granular A horizons; brown sandy clay loam neutral B horizons over yellowish brown partially weathered fractured, plutonic rocks.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Typic Dystrustepts

TYPICAL PEDON: Vieques loam - native pasture.
(Colors are for moist soil)

A1--0 to 5 inches; dark brown (10YR 3/3) loam; weak fine granular structure; soft, friable, nonsticky, nonplastic; common fine roots; slightly acid; clear smooth boundary. (4 to 6 inches thick)

B--5 to 15 inches; brown (7.5YR 4/4) sandy clay loam; weak coarse subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; few fine roots; krotovinas filled with material from above horizon; common rock fragments that vary from 2 to 5mm in size; neutral; gradual wavy boundary. (8 to 14 inches thick)

C--15 to 38 inches; yellowish brown (10YR 5/4) very gravelly coarse sand, structureless; very friable; about 60 percent coarse fragments of partially weathered plutonic rocks; neutral; abrupt smooth boundary. (20 to 30 inches thick)

R--38 to 50 inches plus; consolidated granitic rock.

TYPE LOCATION: Noreste SCD, Island of Vieques, Puerto Rico; 100 feet southwest from kilometer marker 1.6 of Highway 933.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 12 to 20 inches. Depth to consolidated

plutonic rock varies from 36 to 50 inches. Coarse fragments of fractured plutonic rock 2 to 25 mm in size in the lower control section range 50 to 70 percent. Reaction of all horizons is slightly acid through mildly alkaline.

The A horizon has colors of dark brown (7.5YR 3/2; 10YR 3/3), very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). Texture is loam.

The B horizon has colors of brown (7.5YR 4/4, 5/4; 10YR 5/3, 4/3), yellowish brown (10YR 5/4) or dark yellowish brown (10YR 3/4, 4/4). Texture of the B horizon ranges from sandy clay loam through loam. Structure of the B horizon ranges from weak medium through coarse subangular blocky.

The C horizons are typified by yellowish brown (10YR /4) but range in hues of 10YR and yellower with values of 4 through 6 and chromas of 4 through 8. Texture varies from very gravelly loam to gravelly sand.

COMPETING SERIES: These are the Coamo, Cornhill, Descalabrado, Diamond, Guamani, Jacaquas, Jacana, Maguayo, Paso Seco, Southgate, Victory and Vives soils. The Coamo and Jacaquas soils have mollic epipedons. Coamo soils have argillic horizons and Jacaguas soils have 35 percent or more coarse fragments throughout their control section. Cornhill, Guamani and Vives soils have sola with irregular distribution of organic matter content. Cornhill and Vives soils lack lower control sections with 50 to 70 percent coarse fragments. Descalabrado, Jacana, Maguayo and Paso Seco soils have clayey control section with more than 0.09 COLE values. In addition, Descalabrado soils and the Diamond and Southgate soils have hard rock within 20 inches of surface. Victory soils lack lower control sections with 50 to 70 percent by volume of coarse fragments.

GEOGRAPHIC SETTING: The Vieques series occur on moderately sloping to steep sideslopes in the dry uplands. Slopes range from 5 to 40 percent. The regolith consists of loamy soil materials, partially weathered granitic rocks. The climate is semiarid tropical. Mean annual precipitation is 35 inches and average annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Descalabrado and Coamo series as well as the Guayama soils. The Guayama soils have argillic horizons and hard rock within 20 inches of the surface.

DRAINAGE AND PERMEABILITY: Well drained, with medium runoff. Permeability is moderately rapid.

USE AND VEGETATION>: The major part of the acreage is in native grasses and brush. Most is used for pasture.

DISTRIBUTION ND EXTENT: Semiarid granitic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The Vieques series was classified in the Lithosol great soil group. The surface 7 inches (mixed) does not meet the color requirements of a mollic epipedon.

National Cooperative Soil Survey
U.S.A.

LOCATION VIVES PR

Established Series
Rev. RAB: LHR
04/2000

VIVES SERIES

The Vives series have very dark grayish brown, clay A horizons; yellowish red, clay loam B horizons and clay loam C horizons.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Fluventic Haplustepts

TYPICAL PEDON: Vives clay, sugar cane field.
(Colors are for mist soil.)

Ap--0 to 9 inches; very dark grayish brown (10YR 3/2) clay; few medium prominent reddish brown (5YR 4/4) mottles; massive; weak fine subangular blocky structure; firm, slightly sticky, plastic; many fine roots; common fine rock fragments; many fine charcoal pies, neutral; abrupt wavy boundary. (5 to 10 inches thick)

B21--9 to 23 inches; yellowish red (5YR 4/6) clay loam; weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few fine pores; common fine rock fragments; many dark coatings in root channels; neutral; clear wavy boundary. (9 to 18 inches thick)

B22--23 to 32 inches; reddish brown (5YR 4/4) clay loam; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; few fine pores; few fine rock fragments; neutral; clear wavy boundary. (6 to 12 inches thick)

C1--32 to 43 inches; brown (7.5YR 4/4) clay loam; massive; friable, nonsticky, slightly plastic; common subrounded fine rock fragments; neutral; clear smooth boundary. (7 to 12 inches thick)

Cca--43 to 50 inches plus; brown (7.5YR 4/4) clay loam; massive; friable, nonsticky, slightly plastic; many lime splotches; calcareous; moderately alkaline.

TYPE LOCATION: Sudeste SCD, Puerto Rico; municipality of Arroyo, 0.9 miles north of kilometer marker 150.8 of Highway 3.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 20 to 40 inches. The reaction of the horizon above the Cca horizon ranges from slightly acid to mildly alkaline.

The A horizon has colors of very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2) dark brown (10YR 3/3; 7.5YR 3/2) or dark reddish brown (5YR 3/2, 3/3). The A horizon is a clay or clay loam.

The color of the B horizon ranges from brown (7.5YR 4/4) through reddish yellow (7.5YR 6/8) or from reddish brown (5YR 4/4) through reddish yellow (5YR 6/8). Texture of the B horizon is a clay or clay loam few or common. Structure of B horizon is weak fine or medium subangular blocky.

Volcanic rock fragments occur throughout the solum. The C horizon includes the same colors as the B horizons, or as well as dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4, 5/6, 5/3) or brownish yellow (10YR 6/6, 6/8). Texture of C horizon is silt loam or clay loam. Some pedons have gravel at depths below 40 inches.

COMPETING SERIES: These are the Cornhill, Diamond, Dique, Guamani, Humacao, Limani, Maguayo, Paso Seco, Southgate, Victory, Vieques, and Vivi series. Cornhill soils are calcareous throughout. Guamani and Vieques soils have sandy-skeletal lower control sections. Vieques soils and the Victory soils have a regular decrease in organic matter content with depth. Diamond and Southgate soIl have hard rock within 20 inches of the surface. Dique, Humacao, Limini, and Vivi soils have more humid soil moisture regimes. Limani soils have lower base saturation. Maguayo soils have clayey control sections. Paso Seco soils have clayey over loamy skeletal control sections.

GEOGRAPHIC SETTING: The Vives soils occur on nearly level to moderately sloping alluvial fans and terraces above the present river flood plains. Slope gradients are 0 to 12 percent. The regolith is fine and moderately fine textured sediments of mixed origin. The climate is semiarid tropical. The average annual rainfall varies from 25 to 45 inches. The mean annual temperature is about 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Amelia, Guayama, Machete, and San Anton series. The Amelia soils have gravelly clay argillic horizons with 40 to 75 percent coarse fragments and have higher base saturation throughout solum. Guayama soils have hard rock within 20 inches of the surface. Machete soils have argillic horizons with higher base saturation in lower parts. San Anton soils have mollic epipedons.

DRAINAGE AND PERMEABILITY: Moderately well drained. Runoff is medium and permeability is moderate.

USE AND VEGETATION: The original vegetation consisted of native grasses and brush. These soils are used mostly for sugar cane production. A few areas are used for pasture.

DISTRIBUTION AND EXTENT: Semiarid alluvial fans and terraces in Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The Vives series was placed in the Reddish Prairie great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION VIVI PR

Established Series
Rev. RAB-LHR-JEW
06/2002

VIVI SERIES

The Vivi series consists of deep, somewhat excessively drained soils formed in sediments derived from volcanic rocks. They are nearly level soils on river flood plains. These soils typically have very dark grayish brown loam A horizons and dark grayish brown loam B horizons over stratified very fine sandy loam to coarse sand C horizons. TAXONOMIC CLASS: Coarse-loamy, mixed, isohyperthermic Fluventic Hapludolls

TYPICAL PEDON: Vivi loam - cultivated sugar cane
(Colors are for moist soil.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; very friable, nonsticky, nonplastic; many fine roots; many fine quartz grains; strongly acid; clear smooth boundary. (5 to 10 inches thick)

B--7 to 14 inches; dark grayish brown (10YR 4/2) loam; weak coarse subangular blocky structure; friable, nonsticky, nonplastic; common fine roots; many fine quartz grains; medium acid; clear smooth boundary. (5 to 10 inches thick)

C1--14 to 20 inches; dark brown (10YR 3/3) very fine sandy loam; massive; friable; few fine roots; medium acid; clear smooth boundary. (6 to 12 inches thick)

C2--20 to 30 inches; very dark grayish brown (10YR 3/2) loam; massive; friable, nonsticky, nonplastic; many fine quartz grains; medium acid; clear smooth boundary. (8 to 14 inches thick)

C3--30 to 36 inches; dark grayish brown (10YR 4/2) coarse sand; single grain; loose; medium acid; clear smooth boundary. (5 to 10 inches thick)

C4--36 to 60 inches; dark grayish brown (10YR 4/2) sandy loam; common medium distinct brown (7.5YR 4/4) mottles; massive; very friable; medium acid.

TYPE LOCATION: Este SCD, Yabucoa, Puerto Rico; 1,000 feet north of kilometer marker 4.3 of Highway 901.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 10 to 20 inches. The soil ranges from strongly acid to slightly acid. Coarse fragment content ranges from 0 to 10 percent in subhorizons. The mean annual soil temperature ranges from 76 to 80 degrees F.

The A horizons have hues of 10YR or 2.5Y, values of 2 or 3, and chroma of 2 or 3. They are loam or sandy loam and have weak granular or subangular blocky structure.

The B horizons have hues of 10YR or 2.5Y, values of 3 to 6, and chroma of 2 to 4. They are loam or very fine sandy loam to sandy loam.

The C horizons have hues of 7.5YR to 2.5Y, values of 3 to 5, and chroma of 2 to 4. They are stratified loam or very fine sandy loam to coarse sand.

COMPETING SERIES: There are no other known series in the same family.

The Cornhill, Dique, Limani, Maraquez, Morado, Plata, and Vives series are similar soils in related families. Cornhill and Vives soils have ustic moisture regimes. Dique soils have fine-loamy particle-size control sections. Limani soils have base saturation of less than 50 percent. Maraquez, Morado, and Plata soils have regular decrease in organic matter with depth.
GEOGRAPHIC SETTING: The Vivi soils are nearly level on river flood plains. Slope gradients are 0 to 2 percent. The soils formed in coarse to medium textured stratified sediments from plutonic rocks. The climate is humid tropical. The average annual rainfall ranges from 80 to 90 inches. The mean annual temperature ranges from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Coloso, Maunabo, Mayo, Pandura, and Talante soils. Coloso, Maunabo, and Talante soils are somewhat poorly drained or poorly drained and have more than 18 percent clay in the particle-size control sections. Mayo soils have base saturation of less than 50 percent and are on terraces or alluvial fans above the flood plain. Pandura soils are shallow soils on uplands.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained. Runoff is medium to slow. Permeability is moderately rapid.

USE AND VEGETATION: Vivi soils are used for the production of sugar cane and minor crops. Some areas are used

for growing pasture. Native vegetation consists of grasses and brush.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of small extent with about 1600 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

REMARKS:

National Cooperative Soil Survey
U.S.A.

LOCATION YUNES PR

Established Series
Rev. LHR
06/2002

YUNES SERIES

The Yunes series consists of shallow, well drained soils formed in materials weathered from shale. They are steep to very steep soils on sideslopes of strongly dissected uplands. They have very shaly B horizons over bedded fractured shale at a depth of 10 to 20 inches.

TAXONOMIC CLASSLoamy-skeletal, mixed, superactive, isohyperthermic, shallow Humic Dystrudepts

TYPICAL PEDON: Yunes silty clay loam - pasture
(Colors are for moist soil unless otherwise noted.)

A1--0 to 2 inches, dark reddish brown (5YR 3/2) silty clay loam, reddish gray (5YR 5/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; common fine shale fragments; strongly acid; clear smooth boundary. (1 to 4 inches thick)

B2--2 to 11 inches; dark brown (7.5YR 3/2) very shaly silty clay loam; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; 60 percent by volume of shale fragments; strongly acid; clear smooth boundary. (6 to 10 inches thick)

B3--11 to 16 inches; brown (7.5YR 4/4) very shaly silty clay loam; weak medium subangular blocky structure; friable, slightly sticky; slightly plastic; 80 percent by volume of shale fragments; strongly acid; clear smooth boundary. (3 to 6 inches thick)

Cr--16 inches; light red (2.5YR 6/8), strong brown (7.5YR 5/8), and pink (7.5 YR 7/4) bedded fractured shale; thickness of beds is 1 to 4 inches. This material can be dug with difficulty with a spade, when moist.

TYPE LOCATION: San Juan SCD, Puerto Rico, Rio Piedras Experiment Station 50 feet south of kilometer marker

2.3, Highway 847.

RANGE IN CHARACTERISTICS: Solum thickness and depth to bedrock ranges from 10 to 20 inches. The solum has base saturation of 10 to 30 percent. The soil is very strongly acid or strongly acid. The mean annual soil temperature ranges from 76 to 79 degrees F.

The A horizon has hues of 5YR and 7.5YR, values of 2 and 3, and chroma of 2 or 3. It is silty clay loam and fine shale fragments range from 0 to 15 percent by volume.

The B horizon has hues of 5YR and 7.5YR, values of 3 and 4, and chroma of 2 to 4. It ranges from shaly clay loam to very shaly silty clay loam with 35 to 85 percent shale fragments.

COMPETING SERIES: These are no other known series in the same family.

The Adjuntos, Amones, Caguabo, Cuchillas, Descalabrado, Diamond, Juana Diaz, Malaya, Mariana, Mayo, Pandura, Parcelas, Pellejas, Sabana, Santa Marta, and Southgate series are similar soils in related families. Adjuntas, Amones, Mayo, Pellejas, and Santa Marta soils lack a paralithic contact within 20 inches of the soil surface. Caguabo, Malaya, and Pandura soils have base saturation of more than 50 percent. Cuchillas soils have isothermic temperature regimes and high content of organic matter. Descalabrado, Diamond, Juana Diaz, Mariana ,and Southgate soils have ustic soil moisture regimes. Parcelas soils have higher COLE values and crack when dry. Sabana soils have volcanic rock within a depth of 20 inches of the soil surface.

GEOGRAPHIC SETTING: The Yunes soils are steep to very steep soils on sideslopes of strongly dissected uplands. Slopes range from 20 to 60 percent. The soil developed in very shaly residuum from shale. The climate is humid tropical. The average annual precipitation is 76 inches. The average annual temperature ranges from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: This is the Rio Piedras series. Rio Piedras soils have thick sola, argillic horizons, and lack shaly subhorizons.

DRAINAGE AND PERMEABILITY: Well drained, surface runoff is medium to rapid, and permeability is moderate in the A horizon and moderately rapid in the B horizon.

USE AND VEGETATION: Native grasses and shrubs.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

REMARKS:

National Cooperative Soil Survey
U.S.A.